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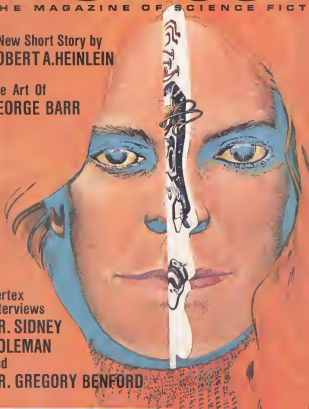
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Interviews
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COLEMAN**
and
DR. GREGORY BENFORD



**MOMENT IN
HISTORY****DR. GODDARD'S
FIREWORKS
MACHINE**

Dr. Robert H. Goddard, at various times a teacher at the Polytechnic Institute, Professor of Physics at Clark University, and a research fellow at Princeton, began his interest in rocketry with smokeless powder machines as early as 1903. In January, 1920, the Smithsonian Institution published his "A Method of Reaching Extreme Altitudes," an omnibus of information on rocket theory, which included the idea of exploding a few pounds of flash powder on the surface of the moon.

In other papers and in his notebooks, Dr. Goddard proposed, between 1906 and 1910, a hydrogen/oxygen rocket motor, a multistage rocket, a camera vehicle for extraplanetary exploration, and the ion rocket for deep-space propulsion.

In 1914 Dr. Goddard applied for and received two patents, one for the design of a pump-fed rocket engine, and one for a multi-stage rocket. He continued to experiment with solid fuel rockets for several more years, then, realizing that liquids held the final answer, he built, and in 1923, successfully fired a pump-fed liquid oxygen and gasoline rocket motor, which he ran for several minutes in a test frame.

Then, on March 16, 1926, at Auburn, Massachusetts, Dr. Goddard launched a small, liquid propellant rocket. It went up only 184 feet, fired for only two and one half seconds, and reached sixty miles an hour, but it was the first, and the direct ancestor of the Saturn vehicle which took man to the moon.

Dr. Robert Goddard anticipated America's space program by 40 years, and in so doing, he laid the groundwork which made that program possible.



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As open and free, almost by definition, as science fiction is, and as intelligent as science fiction readers are supposed to be, I cannot understand why there are some things, ideas, institutions, or what-have-you which seem to have taken on the status of sacred cows, forever free from attack on any grounds.

One of these sacred cows is atomic energy—specifically the production of electrical power by atomic energy. Science fiction seems to be proud of the fact, and justly so, that atomic powerplants, and even the less popular idea, at least these days, of atomic bombs, were predicted in science fiction long before they became a reality. Perhaps this explains why atomic power cannot be criticized. Or perhaps it's just that science fiction has assumed for so long that atomic power is the power source that the very idea that it might not be a good power source, or a safe power source, is heresy. If so, that's a strange attitude for the free-thinkers of science fiction to take.

While I'm not saying that atomic power is bad—I don't know yet, either officially as editor of this magazine or personally as Don Platt—I am saying that it's just plain stupid not to be willing to look at both sides of the atomic power question, and admit, if the facts warrant such an admission, that perhaps all those fictional powerplants are just a little too dangerous to have around the real world.

That's why there's an article a couple of pages on from here reporting on the negative aspects of atomic generation of electricity. Not because I'm suddenly convinced that atomic power is bad, or dangerous, but because, as a hopefully conscientious purveyor of science information and as a science-fiction fiction believer, I have a responsibility to present both sides of a question, even where one of those sides goes against something I've strongly believed in for many years.

And, after reading that article, I think you'll have to agree that there is certainly good reason for questioning the efficacy of atomic energy programs as it exists today. While the various conclusions drawn in the article may be true or false conclusions—more research will be necessary before I, for one, will be willing to accept the article's conclusions without further argument—one central fact seems to have emerged. Someone is lying. We aren't being sold the whole truth by those whose responsibility it is to pass on the construction and/or design of atomic power plants. Oh, they aren't lying to us directly, although there seems to be no lack of lying in high places these days. They just aren't bothering to tell the public the whole truth about some of their programs. The idea of running a series of safety tests—without any form of publicity—with the obvious intention of releasing the results only if those results are favorable to the continuation of the program, is abhorrent to anyone with any claim to being a free man, and if this is what is happening, as it seems to be, then it is time for us to ask why. And who. And then make some changes.

Atomic power may be more than the power wave of the future. It may be our only hope for immediate survival of our technological civilization while other forms of power generation—fusion or sun-power or lithium crystals or who-knows-what—are developed. Fusion or sun or what-have-you power is, at best, still years in the future, and we need power sources now. But if the use of atomic energy to produce power means taking risks if there is a chance of explosions or mass radiation contamination, we must know about those risks. No one, no leader, elected official or appointed commissioner, has the right to decide what risks we will or will not take. That decision belongs to the public, and to make that decision, the public needs full and accurate information, and it needs it now.

Donald J. Pratt

Don Pratt, Editor

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NEWS & REVIEWS

News notes from the world of science and the arts—from space to the prehistoric past—From business contracts to book reviews—from ecology to spacecraft environmental systems

BRAIN CONTAINS FAIL SAFE SYSTEM

MOSCOW—Soviet scientists probing the mysteries of the brain believe they have found a fail-safe system that detects and "corrects" errors people sense they are making.

The scientists said they think the part of the brain that does this is found in groups of cells they call "detectors of errors."

A discussion of the investigation by Natalya P. Bekhtereva, the director of the Institute of Experimental Medicine of the Academy of Medical Sciences of the U.S.S.R., appeared in the magazine *Tekhnika i Obrazovanie* (technique of Youth).

Gold Electrodes

It said Soviet scientists used fine gold electrodes and concentrated their experiments on animals. But they also gathered information from humans who had the electrodes inserted into their brains to diagnose a disease or carry out treatment.

Researcher V. Rechin, said Miss Bekhtereva, asked one patient undergoing treatment with electrodes to memorize and then recite a number of figures and words.

When the patient answered incorrectly, she said, Rechin found the "detector of errors" cells suddenly became active.

"The way they operate is not completely clear," Miss Bekhtereva said. "But it appears that the cells mobilize the brain for amendment of the errors without obvious participation of the consciousness."

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NASA BOARD REPORTS ON SKYLAB METEOROID SHIELD FAILURE

The most probable cause of the meteoroid shield system failure during the Skylab 1 launch was inadequate venting of the pressure in a tunnel under the shield. The differential pressure buildup in the tunnel, as the vehicle rose through the atmosphere, acted to force the forward end of the shield away from the shell of the workshop and into the supersonic air stream.

An investigation board appointed by the National Aeronautics and Space Administration and chaired by Bruce T. Landis made this finding in a report to NASA Administrator, Dr. James C. Fletcher.

When the meteoroid shield was torn loose by the supersonic stream, it broke the bedowns which held one of the two solar array systems on the Skylab Workshop.

Later—about 10 minutes into the

flight—the solar array "wing" was completely torn away when it was struck by the exhaust plume of the second-stage retro-rockets.

Successful operation of the workshop was jeopardized for a time when the remaining solar array would not deploy. A metal strap from the meteoroid shield still attached to the workshop had curled around the wing and penetrated the metal lining which housed the array.

The mission was saved, however, when Astronauts Charles (Pete) Conrad and Joseph Kerwin, acting on the basis of information developed by hundreds of NASA and contractor personnel on the ground, cut the strap. The solar array system was deployed, providing enough power to complete all scientific and technical objectives in a highly successful first manned visit.

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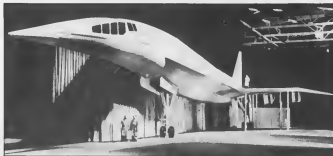
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THUMBS DOWN ON NOISE

WASHINGTON—The federal government recently took its "first, explicit, direct action" to make life quieter in the United States.

It set forth proposed rules for reducing noise from trucks and outlined in more general terms what it hoped to do about making planes and airports quieter.

"This is a milestone," said Alvin F. Meyer, head of the Environmental Protection Agency's noise control office, at a press conference.

He said noise was emerging as a "major national environmental problem," adding that the EPA action amounted to "practicing prevention."

EPA Asst. Administrator David D. Domonick said the noise standards proposed for trucks would affect all vehicles over 10,000 pounds that are operated in interstate commerce.

Such vehicles, he said, would not be allowed to produce more than 90 decibels of noise at a distance of 50 feet while operating over 35 in p.h. The maximum allowed would drop to 86 decibels if the truck was operated under 35 in p.h. and to 80 decibels if the truck was operated on a city street.

EPA noise specialists said that an average car traveling at highway speeds makes about 70 decibels of noise. They added that between 10% and 20% of the

million trucks traveling from one state to another at comparable highway speeds make 110 decibels of noise—sometimes enough difference to make one's eum ring.

EPA said it considered the 90-decibel limit easily attainable and only the starting point for damping down noise on the highways.

Domonick said some of the nation's truck owners would have to install new mufflers and tires with quieter treads on vehicles 10,000 pounds and over.

EPA put the cost of its plan at \$50 to \$200 a truck and \$50 million to \$30 million for the whole trucking industry. That outlay, when passed on as freight charges, would raise the cost of moving one ton of goods one mile less than 0.2%, EPA said.

The proposed regulations start the implementation of the Noise Control Act that Congress passed last year.

Aviation Noise

"The EPA also released a bulky study on the aviation noise problem which said aircraft noise around airports is inhibiting growth of the aviation industry; there is no comprehensive plan for reducing aircraft noise; and installing noise-absorbing padding in aircraft engines is the quickest way available to quiet them."

EPA Asst. Administrator Domonick

said about 16 million people are "seriously impacted by aircraft noise in the United States."

It said it would propose that noise be abated through the following steps:

—The adoption of regulations changing flight and operating procedures. These changes could include steps such as increasing the angle of takeoffs and landings so that the plane stays higher—and thus quieter—for a longer time.

The amendment of current FAA noise regulations to specify lower noise levels for all aircraft built in the future.

—The adoption of regulations to control and reduce noise from existing aircraft. This could include the installation of sound-proofing materials inside jet engines currently in use.

—The setting of cumulative noise levels for all airports. The airport would not be allowed to exceed this level in any one 24-hour period.

Solutions to reducing aircraft noise such as designing quieter aircraft, soundproofing homes near airports and changing the way land near airports is used could cost between \$5 billion and \$20 billion, EPA said, compared to \$700 million for such methods as padding the inside of airplane engine compartments.

The EPA stressed that noise is not just bothersome but detrimental to human health and efficiency.

Its report, entitled "Public Health and Welfare Criteria for Noise," said noise has been blamed for "nausea, headaches, irritability, instability, argumentativeness, reduction in sexual drive, anxiety, nervousness, insomnia, loss of appetite and other ailments."

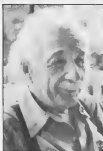
RELATIVITY NOT SUNK YET

Albert Einstein's General Theory of Relativity still stands, according to two Southern California scientists.

Writing in the *Astrophysical Journal*, a scientific periodical, Dr. Andrew Ingersoll of Caltech and Gary A. Chapman of the San Fernando Observatory argue that any excessive bulge at the sun's equator is illusory, rather than real. If they are correct, then Einstein's theory is validated.

If they are wrong—and their opposition, Dr. Robert H. Dicke of Princeton University, is correct—then the general theory of relativity is flawed and scientists will be forced to reconsider the now widely held views of the structure and evolution of the universe.

Einstein's general theory, set forth in 1916, dealt with gravitation. In essence, it stated that the presence of matter in space causes that space to warp, like a



sack, placed on a flat rubber sheet.

The universe might thus be envisioned as an enormous rubber sheet, sagging here and there under the gravitational forces of the planets, stars, galaxies and other objects scattered throughout the universe.

NEW SOLAR TELESCOPE TIED TO SKYLAB

A crane hoisted a 4-ton telescope 80 feet into the air and let it down through the open dome onto the floor of the Big Bear Solar Observatory recently so it can help Skylab astronauts make significant new observations of the sun.

The solar observatory, situated on an artificial island in Big Bear Lake on the San Bernardino Mountains, is a facility of the Hale Observatories, operated by Caltech and the Carnegie Institution of Washington.

The new \$1 million, three-barreled telescope system is capable of making five observations of the sun simultaneously. To save time, much of the calibrating and testing of the telescope was done at Caltech in Pasadena before it was trucked to the observatory.

A telephonic "hot line" has been established between the observatory and the Skylab control center in Houston.

When Big Bear observers spot interesting activity on the sun, they will notify Houston, which will relay the information by radio to the Skylab astronauts, now circling the earth.

The astronauts will make observations of the sun not possible from the earth's surface because of atmospheric turbulence.

Observations from Skylab are expected to provide insight into solar flares, bright eruptions which throw off cosmic rays and other particles and cause atmospheric disturbances on earth.

The new telescope system is much more powerful and flexible than an older one it is replacing, said Dr. Harold Zinn, Caltech professor of astrophysics and member of the Hale Observatories staff who supervised the design and construction of the Big Bear observatory.

"With it we can make a greater variety of more detailed observations simultaneously," he said.

The theory was quickly accepted by the scientific community then and now, it explained a wide number of observed phenomena, such as the slight shift in space of the planet Mercury's point of closest approach to the sun.

In the Einsteinian scheme of things, that shift is easily explainable: as Mercury draws near the sun, the gravitational forces acting on the planet cause it to speed up. But after passing through perihelion, or the point of closest approach, it overshoots slightly and its orbit is changed just enough that perihelion occurs at a different point in space the next time.

But Dicke advanced another idea in the mid-1960s. The widely respected Princeton physicist suggested that the sun has an unusually large midriff bulge—larger than that which would normally be caused by centrifugal force—and that it is this excess solar matter which leads to variations in the sun's gravitational field and which thus explains Mercury's curious wobble.

But is the sun oblate—that is, unusually wider at the equator than it is at the poles?

Ingersoll and Chapman say that it is not. After reviewing the data advanced by Dicke and a colleague, Mark Goldenberg, in 1967 in support of the Princeton theory, the Californians concluded that any exceptional bulge was an optical illusion.

Specially, they put the illusion on faculae—large, irregular patches of superbright light visible on the sun's equator.

Dicke and Goldenberg had deduced that the superbright light came from an equatorial bulge that is perhaps 30 kilometers greater in diameter than a line drawn through the sun's north and south poles.

"What we're suggesting is quite plausible," said Chapman, "and explains anywhere from one-third, at the very least, some-half of the apparent bulge observed by Dicke."

Reached by telephone at Princeton, Dicke said that Ingersoll and Chapman were overestimating the illusory effects of the faculae and that the sun really is an oblate as he claims.

But an experiment being conducted at the University of Arizona to determine the exact amount of solar oblateness has so far turned up preliminary (and as yet unpublished) data which does not completely corroborate Ingersoll and Chapman, but which does fail to support Dicke's theory.

NEW! OFFICIAL LIQUOR & WINE BUYERS' GUIDE

by Jack Lewis

Author Jack Lewis says that half of what we think we know about buying, drinking and serving liquor and wine is totally false, and the other half is questionable. But one thing is for sure: we're paying too much for what we think we're getting. This guide takes the mystery out of the alcoholic beverage imbroglio and delivers clearly the jargon that has been fooling the public since prohibition. It will teach you the real difference between good and bad liquor—regardless of brand—and how to buy good liquor at the very best price. The Official Liquor and Wine Buyers' Guide is fun to read, an entertaining book and an indispensable reference that ought to be kept within easy reach. You owe it to your pocket book.

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BOOK REVIEWS



COOKING OUT OF THIS WORLD

Anne McCaffrey
Ballantine Books, \$1.50

Imagine a book edited by Anne McCaffrey with names like David Gerrold, Frank Herbert, Ursula K. LeGuin, Fritz Leiber, Murray Leinster, Rachel C. Payne, James Schmitz, Robert Silverberg, Kate Wilhelm, and many more, listed in the table of contents. Next, after you stop drooling, imagine that the book contains no fiction. Look back at the cover, and discover, in small letters, the word cooking. Ah! It's a cookbook. A Cookbook? Yep. A science fiction cookbook, with the favorite recipes of some 58 science fiction writers. Included are Scrambled Eggs à la Beamer, Edward Bryant's Granolet Nohet, Spum Chowder by Grant Cragston, Marc Haelele's Cosmic Mincemeat, Ursula LeGuin's Crab Nebula, Robert A. Lowndes' Brutally Whipped Potatoes, and the ultimate, Gopher Stew by Walter M. Miller. If you're one of those unfortunate persons addicted to food, you need this book. Read it, try some of the recipes, and you'll never be the same.

Many science fiction writers are considered not-quite-normal. Judging from some of the recipes in COOKING OUT OF THIS WORLD, not-quite-normal isn't the phrase for it. More like stark, staring mad!

SAVING WORLDS

Roger Elwood and Virginia Kidd
Doubleday, \$6.95

It was bound to happen sooner or later, if that's any consolation. Just about every possible excuse had been used for gathering a collection of stories into an anthology, and with the current degree of ecological faddism, an ecological anthology was inevitable. Not that the stories aren't pretty good—with authors like Terry Carr, R. A. Lafferty, Paul Anderson, A.E. Van Vogt, Robert Silverberg, and more, it's equally inevitable that there will be some good, and even very good, stories in the book. We may be doing Mr. Elwood and Ms. Kidd an injustice, but we're getting a little tired of ecology because it's "in," and that seems to be the only reason for this book.

vertex

BEST SCIENCE FICTION FOR 1973

by Forrest J Ackerman
Ave, \$1.25

To properly enjoy an anthology chosen by Forry Ackerman it helps if you're something of a masochist. It's not absolutely necessary, but it does help. Forry has an almost uncanny knack for picking really good stories. We have an argument with him there: Eighteen stories from the U.S., England and Russia, along with Fredrick Pohl's Guest of Honor speech from the World Science Fiction Convention, make this a fascinating book to read. So, why does it help if you're something of a masochist? Have you ever been subjected to Forry's puns? You have been warned!

THE BEST SCIENCE FICTION OF THE YEAR

by Terry Carr
Ballantine, \$1.25

While you may agree or disagree with any given editor as to which are the best science fiction stories of the year, you certainly can't disagree with Mr. Carr's choice of writers: Anderson, Bova, Bryant, LaFerry, Panofsky, Perl, Kornbluth, Reznick, Russ, Silverberg, and more. Our only disagreement with Mr. Carr is his obvious leaning towards the "new wave" type of fiction, and his apparent abhorrence of anything which smacks of plain, old-fashioned story telling. If that's your bag (new wave), this is your book.

THE BEST SCIENCE FICTION STORIES OF THE YEAR

by Lester del Rey
E. P. Dutton, \$6.95

Yes, Virginia, there is yet another best of the year, this one differentiated from Terry Carr's by the addition of one word in the title. Like Forry Ackerman's, this "Best" has an excellent and well-sounded selection of stories, both novel

and new wave. Like Terry Carr's, this "Best" has a good selection of name authors. Unlike both the others, this one is hardcover, at roughly four times the price. But, when it comes right down to it, it's worth it. While it isn't outstandingly better than either of the others (after all, both of them are very good books in their own right), it is somewhat better, and it is definitely better balanced. All in all, a good addition to any collection.

MUTANTS

by Gordon R. Dickson
Collier Books, \$1.25

Subtitled "A Science Fiction Adventure," one might at first think that this is a novel, at least from the title, despite the fact that the cover specifies that the book is made up of eleven short stories. It could, of course, be eleven short stories which all tie together to make a novel—but it isn't. What it is is eleven short stories with the common theme of mutated men, stories which have appeared across the years in various science fiction magazines. All of that is the bad part of the book. The good part is, of course, that Dickson is one hell of a writer, and these are excellent stories. Gathered together, they make an excellent book.

ANDROIDS, TIME MACHINES AND BLUE GIRAFFES

by Roger Elwood and Vic Gidala
Follett, \$6.95

If you believe you can mix Asimov, Bierce and Arthur C. Clarke, H. P. Lovecraft and Isaac Asimov, this you'll believe in the possibility of this book. The only thing that ties them together in the spine of the book, as once again an anthology tries to mix nineteenth and twentieth century fiction, fantasy and science fiction, and come up with a miscellany book. And, once again, the whole thing is a failure, a waste of the Elwood and Gidala talents, and their reader's time.

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A recent Federal Power Commission report predicts that the nation's power requirements will quadruple between 1973 and 1990. The report also predicts that nuclear plants will meet more than 50 percent of the nation's power needs within the next two to three decades as compared with about 2 percent at the present time. As of May, 1973, there were 31 operating civilian nuclear power electrical plants.

The Atomic Energy Commission predicts that by the year 2000 there will be 900 nuclear power plants in operation in America.

Its essential parts are: (1) arrangement of nuclear fuel, referred to as the reactor core; (2) a control system which serves to regulate the rate of fission and thereby the rate of heat generation; and (3) a cooling system which serves to carry the heat from the reactor and also to keep the core at the proper temperature.

Nuclear Fission. Certain heavy atoms, on being struck in the right way by a sub-atomic particle called a neutron, split into two or more fragments and release energy in the process.

The fragments, called fission products, fly apart at great speed and generate heat as they are slowed down by collisions with surrounding fuel matter.

As the fuel atom splits, it releases two or three neutrons, making possible a chain reaction in which a neutron from atom A causes atom B to undergo fission, which in turn releases neutrons to strike atom C, etc.

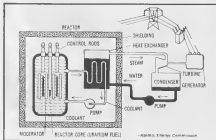
Neutrons are most effective in triggering fission when they are traveling at slow speed. Most reactors contain a material called a "moderator" which slows down the neutrons as they pass through it. In water-cooled reactors, the reactor coolant serves as the moderator.

The rate of fission (and hence of heat generation) is controlled by regulating the number of free neutrons present in the core. This is done by means of neutron-absorbing substances which soak up neutrons much as a blotter soaks up ink. Adjustable rods containing these substances (control rods) are moved in and out of the core as necessary during reactor operation and when fully inserted, shut down the reactor.

Although a nuclear reactor does not create smoke, fly ash, or sulfur dioxide, it produces three kinds of radioactive pollutants: solid, liquid, and gaseous.

SOLID—packaged and shipped to disposal plants.

REACTOR DEFICIENCIES STUDY



Nobody denies that there's an energy crisis, or that atomic power is one of few possible solutions. But the rush to atomic power is creating some potentially disastrous situations.

GASEOUS—products emanating from radioactive fission and carried into the turbine by steam. Do not recondense as does water. Stacks three hundred feet high discharge into the local environment.

LIQUID—from leaks and planned removal of primary coolants. Although

secondary coolants do not themselves contain appreciable radioactivity, those from the primary coolant are metered into the secondary coolant water being discharged into the local river or lake.

Radioactive wastes are created whenever radioactive materials are used. By far the greatest source of wastes is the

nuclear fuel cycle. The milling, mining, and preparation of fuel for reactors and weapons produce wastes containing natural radionuclides, and fuel irradiation and subsequent processing produce wastes rich in fission products. Additional wastes are produced by irradiation of nonfuel material in and around reactors.

Disposal and storage of these wastes is hazardous. Solid wastes, such as clothing and tools, are customarily buried in cement drums either in trenches on land or at sea. Low-level liquid wastes resulting from impurities in the coolant water are discharged into the environment. The high-level fission wastes, millions of gallons of which are already in storage, remain highly radioactive for hundreds of years while the storage tanks, which boil like teakettles from the intense heat, will suffice but for decades. A single gallon of this waste released into the environment would be sufficient to threaten the health of several million people. Disposal is a nightmare for perpetual guardianship.

Radioactive wastes involve more than the reactor and its byproducts. Waste ore, called mine tailings, is piled up outside uranium mills from Texas to Oregon, and these deposits emit radioactivity. The dust from these mounds blows into the atmosphere and water systems, raising in certain areas radioactivity readings well above the maximum permissible levels suggested for human consumption, and, furthermore, tailing sand has been incorporated into children's sand boxes and into the construction of homes—the radon gas given off by tailings is the prime cause of lung cancer in uranium mine workers.

Nuclear power plants operate inefficiently. They function at about 32% efficiency (versus 40% for fossil fuels). For every three units of heat formed, one unit produces electricity, and two units are discharged as waste. They require 50% more cooling water than do fossil-fuel plants of equal size, and that water gets as much as 20% hotter. In addition, the nuclear plants send out all their waste heat as water. Thermal pollution can upset and disrupt aquatic ecosystems—ultimately altering food chains.

Transportation of radioactive materials is yet another area of concern. The route taken by uranium and its fission products before reaching final disposal (or dispersal) is a long one, extending from the mine to the refining mill to the fuel fabrication assembly plants to the reactor vessel to the reprocessing facility (where enriched fuel and economically recoverable

by radionuclides are extracted) and finally to disposal ponds.

David Lalenthal, former chairman of the AEC, is among those who have expressed doubts on the subject. "These huge quantities of radioactive wastes must somehow be removed from the reactors, must—without mishap—be put into containers that will never rupture; then these vast quantities of poisonous stuff must be moved either to a burial ground or to reprocessing and concentration plants, handled again, and disposed of, by burial or otherwise, with a risk of human error at every step."

And accidents in transportation have occurred. Trucks bearing radioactive materials have been involved in accidents, and in one instance a train carrying radioactive materials derailed.

Unique and very substantial hazards are associated with nuclear power reactors. They contain enormous quantities of radioactive materials, the "ashes" from the fission (splitting) of uranium, whose accidental release into the environment would be a catastrophic. Great reliance is placed on engineered safety systems to prevent or mitigate the consequences of such accidents. Foremost among safety systems are the emergency fuel-core cooling system which, should normal cooling systems accidentally fail, are designed to prevent an overheating and melting of the reactor fuel and subsequent release of lethal radioactivity into the environment.

If the emergency cooling system did not function at all, the core would melt and the molten mass of uranium and UO₂ (uranium oxide) would collapse and probably melt through the pressure vessel in 30 minutes to one hour.

It seems certain that melt-through will be a catastrophic event in that large quantities of molten material will be discharged suddenly, releasing radioactivity and endangering large numbers of people.

Concern over ECCS began in 1965 with the sale of increasingly larger nuclear reactors. When initial tests were run by Argonne Nuclear Company at the National Reactor Testing Station in Idaho, mechanical failures occurred in the winter of 1970-71. Argonne ran a significant series of tests using a 9-inch-diameter model reactor core and electric instead of nuclear heating as fuel. All six tests of the model ECCS failed. The reactor community was alarmed. But the dismal story doesn't end here.

In 1966, there were 42 accidents at nuclear plants around the world, 37 in the U.S. Six U.S. plants had more than

one accident. These included fuel-rod leaks, control-rod failures, explosions in beam tubes, fission gas release, fuel meltdown and plugged cores.

Since 1945 there have been some 230 accidents involving nuclear reactors, according to Leo Goodman, former Sec of the Atomic Energy Technical Committee, AFL-CIO. Such accidents bring into sharp focus that man is not infallible, that the materials are not always dependable, that structural designs are not always flawless, and that equipment can be defective—that the unexpected can happen. In the case of the worst accident an AEC Report WASH-780, also known as the Brookhaven Report, projected:

- 1) economic damage in the range of \$7 billion—over and above the human injuries and loss of life,
- 2) fifteen states the size of Maryland might be contaminated, agriculture restricted or forbidden, water supplies contaminated, other power plants contaminated,
- 3) half a million people might need evacuation fast. These radiation refugees would have no place to go, and probably no one would want them,
- 4) another 3½ million people might have their outdoor activity restricted to keep them from receiving high radiation doses,
- 5) there might be general panic, and people might demand that all the nuclear power plants in the country be shut down—extending the economic chaos,
- 6) there might be 3,000 or 4,000 people dying from acute radiation exposure,
- 7) plus another 50,000 people dying later from radiation-induced cancer.

The Report postulated an accident at a small 230Mw nuclear power plant located about 30 miles from a city. Nuclear plants are now being built and planned five times bigger than they were when WASH-740 was written in 1957—i.e., they produce five times more radioactivity per year. Huge reactors are now being built within a radius of 25 miles from the centers of major cities, all over America.

In addition to the hazards of serious accident are the possibilities of sabotage and the theft of nuclear materials, which, like the problems of waste disposal and accident prevention, cannot be completely removed, although the risks can be reduced. The current plague of aircraft hijackings has made it clear that

turn to page 12

COMPUTER CURBS TO AVOID 1984

WASHINGTON—Surveillance of private citizens was to be expanded while John N. Mitchell, vice attorney general, said fears about a 1984-type American society were nearly justified, a government advisory panel said recently.

The panel, in a report to the Department of Health, Education and Welfare, recommended extensive restraints on operation of computer data banks containing information about individuals.

It also urged curbs on what it called a dangerous drift toward the use of Social Security numbers as standard, universal identifiers.

The group made several references to the highly controlled type of society depicted by novelist George Orwell in his book "1984." And in a statement summarizing the report, HEW also made mention of fears of Orwellian-type surveillance of citizens.

Citing Mitchell by name, the report on "Records, Computers and the Rights of Citizens" said his major goals while in office—from early 1968 to mid-1972—were to strengthen the law enforcement capability of the federal government and to increase the powers of police and prosecutors at all levels.

Surveillance Expanded

"To this end he greatly expanded federal surveillance of citizens thought to be threats to internal security justifying his action on the theory that the executive has inherent and discretionary power to protect itself," the report said.

"He made aggressive use of existing laws and sought and obtained significant new legislation to arm police and prosecutors with expanded authority to monitor individual conduct in order to prevent or punish potential crimes."

Activities cited "under Mitchell's leadership" included more federal wiretapping, preventive detention of suspects, authority for police to enter homes without warning (the so-called no-knock law), and authorizing judges to impose greatly expanded sentences for "dangerous special offenders."

"These developments, when viewed in conjunction with the new surveillance technology funded by LEAA (the Justice



Department's Law Enforcement Assistance Administration) grants and the national computerized file on criminal offenders, greatly increase the capability of the government to monitor the activities of all citizens and to step in to prevent or punish those activities where it chooses to do so," the report said.

Vast Dossiers

"The new criminal justice information network can be used in conjunction with

the vast government and private computer dossiers being compiled by credit bureaus, insurance companies, welfare agencies, mental health units and others.

"Cumulatively, these files threaten an information tyranny that could lock each citizen into his past. They signal the end of a uniquely American promise—that the individual can shed past mistakes and entanglements and start out anew."

BRAIN, from page 6

Sense of Direction

She also said the cells appear closely related to sense of direction and cited South American Indians who she said, never misroute their way home in tropical jungles.

"But at a certain moment, the hunters say it is high time to return home and they find their way precisely," Miss Belkireva said.

This ability of subconscious orientation also is highly developed in cats and horses, she said.

"It is possible that the foundation of the detector of error cells in humans is made of considerably reduced and changed centers inherited from animal ancestors," she said. "It is not excluded that the alarming nervousness feeling (that something has gone wrong) is somehow connected with this group of cells."

REACTOR, from page 11

society is highly vulnerable to determined efforts at sabotage and that these are extraordinarily difficult to prevent.

It is clearly not beyond possibility that a nuclear power plant could be held hostage for financial gain or for political purposes as aircraft now are so frequently.

With the increasing social tensions that are bound to accompany the growth of populations, the depletion of natural resources, and the present widening economic gap between the rich and the poor nations, it would seem prudent to assume that such upheavals may be even more intense in the coming years. Nuclear fusion plants will be enormously attractive objects for sabotage and blackmail. A well-placed charge of explosives, in the midst of one of these huge concentrations of radioactive material, could blow into the air enough radioactivity to be carried by the winds

vertex

COSMONAUTS TO VISIT JOHNSON SPACE CENTER

A 34-member delegation from the Soviet Union, including 10 cosmonauts, began a visit to the Johnson Space Center recently to further plans for a joint mission in 1975.

The delegation is headed by Professor Konstantin D. Bushayev, Apollo-Soyuz Test Project Technical Director for the Soviet Union. Delegation members include the prime and backup flight crews for the mission, the Mission Model and Operational Plans working group, cosmonaut training specialists, interpreters and administrative support personnel.

Prime Soviet cosmonauts are Cosmonauts Aleksey A. Leonov and Valery N. Kubasov. Leonov performed the world's first extravehicular activity during the Voskhod 2 flight, and Kubasov was a Soyuz 6 crewman.

The crew for the second Soyuz spacecraft which the Soviet Union will be prepared to launch if necessary consists of Cosmonauts Anatoly V. Filipchenko and Nikolay N. Rukhovich. Filipchenko flew on Soyuz 7 and Rukhovich was a crewmember on Soyuz 10.

Backup crewmen are Cosmonauts Vladimir A. Dzhibibekov, Boris D. Andreyev, Yuriy V. Romanenko and Aleksandr S. Ivanchenko.

The crews are being accompanied by two veteran cosmonauts who attended ASTP meetings here last March, Major General Vladimir A. Shatalov and Dr. Aleksey S. Yeliseyev.



This will be the initial familiarization visit for the crews, and specific mission training will not be conducted. Activities will consist primarily of classroom lectures on the basic elements of the Apollo spacecraft, the Apollo life support and communications systems, the ASTP docking module and basic flight plan time lines.

Several members of the United States' ASTP flight crew will visit the Soviet Union this fall for familiarization on the Soyuz spacecraft.

Scheduled for launch July 15, 1975, the Apollo-Soyuz Test Project mission is designed to checkout in flight a compatible docking mechanism developed by both countries to provide an international space rescue capability. Soviet and American crews will exchange visits in space and may conduct several joint scientific and technical experiments.

over thousands of square miles, and perhaps render large areas uninhabitable for decades.

And then there is an even more startling revelation. As nuclear power plants come into increasing use, large stockpiles of atomic fuel and spent nuclear fuel elements will be created—from which people with a certain amount of scientific knowledge could make crude nuclear bombs.

As the nuclear industry grows and as literally tons of plutonium are shipped about the country annually, these problems will worsen. Given the catastrophic nature of a single theft, it is by no means assured, once again, that thoroughly satisfactory protective measures are possible. As in other aspects of the nuclear industry some irreducible risk of clandestine nuclear weapons diversion will be attached to the development of nu-

clear power. It is not entirely clear that when this risk is exposed to general public attention, the benefits of nuclear power will be generally agreed to outweigh the hazards.

*Plutonium (the most toxic substance known to man) possesses a reduced half-life of over 24,000 years. Plutonium will be needed in tremendous quantities to fuel the new "breeder" reaction so-called because they create or breed fuel, which are currently being pushed ahead to solve predicted uranium shortages. These (breeders) present even more serious hazards than conventional nuclear plants.

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A NICE PLACE TO VISIT

*fiction/Stephen Goldin
art/Steven Arnold*

They weren't dead, but as far as JAVA-10 was concerned they might as well be.



The boundary of the city lay precisely half a meter from the toes of Ryan's boots. Ryan stood there in no particular hurry to cross that line. Fifty centimeters were all that stood between him and possible madness. He gazed at the city, trying to read something from its inscrutable silhouette—trying, and failing.

Finally, he pulled the communicator out of his pocket. The cold, metallic, rectangular box felt oddly comforting in his hand. This was a symbol of Earth, here amid the alienness of this planet. Somehow, the ship—and even Earth itself—was not quite so distant as long as he held it. Ryan was not an exceptionally brave man, despite all the propaganda,

planetary scouts tended to have their own human failings and fears. Ryan's fear was loneliness.

He spoke, though, in calm, even tones. His voice went, not to any of the humans on the ship, but to the JVA model computer that ran it. Human society had become too large, too diversified, too complex for human minds to grasp, and so mechanical help was needed. Computers had become father-mother-teacher to the human race. Java-10 was the portable counterpart to the enormous brain that controlled the Earth.

"I am about to enter the city," Ryan said.

"I needn't stress the importance of caution," answered Java-10. "First pre-

"Men had entered this city, the only one on an otherwise desolate planet, five times before. None of those men had ever returned."

vicious expeditions were lost in there. Try to maintain frequent, if not constant, communications. And remember, if you fail, there will be no more attempts. The city will have to be destroyed despite its potential value."

"I understand," Ryan said tersely. "Over and out." He clicked off his communicator and stuck it back in his pocket.

He stood before the boundary and hesitated. Over to the right, his scout ship squatted beside the five others, primed and ready for instant take-off should the need arise. Behind him, he sensed the desert, dry and dead, its dust dunes shifting softly whenever some chance breeze blew across them. Ahead of him waited the city, sharp in its outline, its beauty, and its utter alienness. Shimmering walls jutted at crazy angles, seemingly products of a drunken architect's delirium. Fragile, almost fairy-structures sprouted sideways out of one another, sometimes hundreds of feet off the ground. Other buildings, even more astounding, seemed just to hang suspended in air, with no visible support. Occasionally, a wind touched the city and set the entire works vibrating like a singing crystal, so that the city seemed to sigh a song.

Men had entered this city, the only one on an otherwise desolate planet, five times before. None of those men had ever returned. Detectives had shown no life forms whatsoever before men came. Sixteen life forms reappeared now—the sixteen men who had vanished within. And now it was Ryan's chance to make it seventeen.

No one had any idea of who had built this city, or when, or why. All that was known was that it had swallowed sixteen men, alive yet apparently powerless to escape despite the best armaments Earth could provide. The city generated a field of unknown energy that radiated outward spherically from the city's center to a certain distance, and no further. Some of the men who had entered the field had continued their radio contact with their ships for some time afterward, but the information received had been close to useless, for the men had slipped deeper and deeper into states which could only be termed delirium, eventually losing touch with reality completely and ceasing communication.

Earth's curiosity and need for the technology this city represented was powerful. Because of it, sixteen men had entered the city and gone insane.

Perhaps, then, would be a seventeenth.

Exhaling loudly, Ryan crossed the boundary.

Nothing happened. Ryan stood there expectantly, muscles tensed and jaw set, but there was no difference between his sensations now and his sensations of a moment before. He took his communicator out of his pocket once more, relaxing the comfort it gave him. "I have just crossed the boundary into the city. So far, I feel no effects."

"Good," replied the ship. "Proceed toward the center of the city. Move slowly and take no chances."

"Acknowledged," said Ryan, and clicked off again.

The nearest buildings were still over a hundred meters away. Ryan approached them with great deliberation. Every sense was straining, seeking some signal, however faint, of danger. Nothing moved, and the only sounds were the whispeness of the wind. The city had no odor at all, which was even more noticeable than a stench. Ryan had the faint impression of stepping into a crystal castle, but that thought vanished quickly.

He arrived at the first building and reached out a tentative hand to touch it. It was smooth and hard like glass, yet opaque, it felt neither cold nor warm to his quivering fingers, but it did make his fingertips tingle. He withdrew his hand. The places where his fingers had touched were small, dark marks against the otherwise milky surface. The spots faded as he watched, until the whole wall was uniform once again.

There were no openings or breaks anywhere along the wall. Ryan walked alongside it, parallel without touching it again. He looked for a doorway or opening of some kind by which he could enter the building. The wall seemed smooth, hard, and continuous with no apparent terrace. Yet suddenly a section of wall shimmered out of existence, leaving a spacious portal for Ryan to use. He jumped back, startled, then pulled out his communicator and described this latest development to the ship as orbit above him.

"Has anything else of potential danger happened?" was the reply.

"Not yet. There still doesn't appear to be any sign of life, other than the appearance of this door."

"Then you must take the risk of going in and exploring," Java-10 said coldly.

"Sure, Ryan thought, what do you care? It's not your skin." "Acknowledged."

He had a flashlight with him, but one glance inside showed him that he

wouldn't have to use it. The interior of the building was brightly lit, the glow seeming to diffuse from the walls. Eerie, Ryan looked wonderingly about him.

The building was utterly bare of furnishings. The only detail in it was a broad spiral staircase that ascended along the cylindrical walls, up, and up, and up. The scout craned his neck back to follow the stairway's course, but it just seemed to keep on going to infinity. Every twenty-five steps, there was a wide landing with a little window in the wall to look out upon the city. A banner of clear plastic ran along the inner edge of the staircase.

Ryan moved forward slowly, still alert for anything that might happen. The echo that his boots made as they scraped along the hard stone floor was almost deafening in comparison to the total silence that blanketed the rest of the city. He reached the beginning of the staircase and put his hand on the railing. The plastic felt cool and strangely comforting, as though he had run into an old friend amongst this strangeness. He started up the stairs cautiously, one foot ahead of the other, his hand firmly on the guard rail. His eyes scanned from side to side, watching for any conceivable danger, but none appeared. There impatiently gripped him, and he started running up the stairway.

He stopped for breath, finally, at the fourth landing. He was now perhaps some sixteen meters above the ground level. The doorway was still there, waiting patiently for his return, but it looked much smaller from this height. He walked over to the window, looked out, and saw:

New York City at noonday, its pavements filled with businessmen on their way to lunch, shoppers in transit between stores with parcels under their arms.

He blinked and looked again. There was only the alien city, rising squat and silent, waiting, ever waiting. Silent. No movement, no sound, no shadows.

With shaking hands, Ryan practically tore the communicator from his pocket. He let his trembling fingers caress its rectangular form for a moment, then put it in another call to the ship. "This is Ryan calling Java-10. I've just experienced a hallucination." He went on briefly to describe what had appeared to him for just a second outside the window.

"Interesting," mused the computer. "This correlates with reports of other hallucinations observed by your predecessors. Whatever happened to them is just now starting to happen to you. You

"All previous explorations had been made by teams of two or more, and they had all failed; perhaps a single man stood a better chance."

must be double cautious from now on."

Ryan sat down on a step to regain his composure. He wished that his partner, Bill Treiman, had been allowed to accompany him on this mission. He and Bill had been a team ever since training school. Together, they had scouted over thirty worlds, facing the unknown side by side. He wouldn't be feeling so lonely now, he knew, if Bill were here with him. But the computer didn't want to risk more personnel than was absolutely necessary. Besides all previous explorations had been made by teams of two or more, and they had all failed—perhaps a single man stood a better chance.

A movement caught the corner of Ryan's eye. He whirled his head quickly to see what looked like a human figure run under the stairs beneath him and vanish. A red-headed figure. Bill Treiman's figure. And that was patently ridiculous, because Bill Treiman was back on board the ship.

Nevertheless, Ryan walked slowly back down the stairs to investigate. There was, of course, nobody there, the wall beneath the stairs was smooth and hard, with no hiding place for any running person. No, the building was deserted except for him. The silence attested to that.

"Looking for something, Jeff?" came a voice from above.

The man who stood on the third landing was not Ryan's partner. Instead, it was Richard Bael, an old acquaintance from Academy days. "Oh, don't worry," Bael smiled. "I'm quite real."

That made sense. Bael had been one of the first men to enter the city. "How did you get there?" Ryan stammered.

"Oh," Bael shrugged, "there are ways." He started to walk easily down the steps. "You'll learn, after a week or two."

"I don't plan on staying that long," Ryan answered defensively. He tried reaching slowly for the communicator in his pocket, but Bael spotted the motion.

"Oh, are you going to call your ship? May I say a few words to them?"

"They'd love to hear from you," Ryan said. "What happened to your own com unit?"

"I must have set it down someplace and then forgotten about it," Bael said with a wave of his hand. "I didn't really think it was all that important." He reached Ryan's side and held out his hand. Ryan gave him the communicator.

"Hello up there, this is Richard Bael calling. Can you hear me?"

"Yes," answered the emotional voice of Java-10.

"I have a delayed report to make in connection with my exploration of this city. I assume you've got all your tapes going, ready to record every word of it?"

"Correct."

"All right, then, here it is. *Scow you.*" He switched off the set and handed it back to Ryan. "I've always wanted to do that, but I never had the nerve before," he grinned good-naturedly.

Ryan snatched the communicator from his hand, slightly horrified at Bael's action. "This is Ryan calling Java-10. Do you read me?"

"Affirmative. Is Bael really there with you?" The question was flat rather than incredulous.

"He seems to be."

"I'm really Peter Pan," Bael put in whimsically.

"Shut up!" shouted Ryan.

"No need to be so touchy, Jeff. I was just trying to be helpful."

"Ask him why he does not leave the city," Java-10 insisted.

"Oh, don't answer, Jeff. I'm tired of playing that computer's little games." He started moving toward the doorway. "Put that stupid set away. The day's too nice to spend it talking to a box."

Ryan hesitated.

"Look, you came here to explore the city, didn't you?" Bael continued. "Well, I'm all set to give you a guided tour. What are you waiting for—an engraved invitation? Okay, have one."

He pulled a small card from his pocket and flicked it at Ryan's feet. Ryan bent down and picked it up. Engraved on it, in gold lettering, were the words: **MIL RICHARD BAEL GRACIOUSLY REQUESTS THE PRESENCE OF MR. JEFFREY RYAN FOR A PERSONALLY CONDUCTED TOUR OF THE CITY.**

"That good enough for you?" Bael asked conversationally.

Ryan carefully shoved the card in his samples pouch for further analysis later. "All right, Bael, have it your way." The communicator went back in his pocket. "Lead on."

With a flourish, Bael moved out the doorway, with Ryan two steps behind. After Ryan had passed through, the opening vanished and the wall was solid once more. He refused to worry about a minor detail like that. He had little doubt that the city would have much bigger surprises in store for him before long.

And he was quite right.

The two men walked through the city, Bael at a leisurely pace and Ryan chafing with impatience at having to match the other's infuriatingly slow ambles. There were no real streets to follow, for the city seemed not to be laid out in any discernible pattern and there were no long stretches of open ground wide enough for any type of vehicle. Buildings of all shapes, sizes, and colors sprang up everywhere, here a cylinder, there a cone, a little farther on a hemisphere.

There were even a couple that changed their shapes as Ryan watched them.

"Who built this city?" he asked Bael. "Why did they do it? Where did they go?"

"It's a nice place, isn't it?" Bael ignored the questions and gestured at the city around them.

"That's no answer."

"Of course not. I don't have any. Questions are unimportant here, so answers are irrelevant."

"They sure as hell aren't. I have to know."

"Correction. Java-10 has to know. You don't have to do anything but enjoy yourself." Bael checked sympathetically. "You poor dumb bastard, you've been so brainwashed that you don't even recognize freedom when it smacks you in the face. Let's sit down and talk for a bit."

Two comfortable-looking chairs appeared behind them. Bael took one and motioned for Ryan to take the other. The seats tested it intensely before placing his weight in it. "What do you want to talk about?" he asked after he'd settled in.

"Let's start with why you're here."

"The same reason as you—to find out about the city."

"Why?"

"Technology, mostly. Anyone who could build a place like this must be so far ahead of us that we stand to learn something just from examining their artifacts. We have to find out."

"We?" Bael interrupted. "Do you really include yourself in that?"

The interruption made Ryan lose his train of thought, and he could only blink uncomprehendingly.

"Be honest. Were you, personally, ever that curious as to what was in this city to risk losing your sanity by coming down here?" Bael's eyes were aglow with life as he eagerly pressed his point home.

"Did you volunteer for this mission, or

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THE RATIONALIZATION OF PRAGMATIC TIME



Covered wagons and one time zone per day travel was no problem, but modern speeds and modern forms of communication makes jet lag a serious mental and physical problem that one time zone would solve.

article/Lawrence Neal

The scions and military of almost all the nations of the world measure time from the same base: Greenwich Mean Time, the mark of a small town in England. At the same time, Saudi Arabia is on *Arabic Time*, where each day starts and ends at the official sundown, which makes noon and midnight come at different times on each day of the year.

England recently adjusted its time one hour ahead, at the same time joining the common market, and now all of Europe is on the same time standard. At the same time, Canada, the same width as the United States for all practical purposes, is divided into seven time zones.

The People's Republic of China (Mainland China) has been unified under one time zone, despite being broader than the United States, while the U.S. still has four continental time zones, plus Atlantic, Yukon, Alaska/Hawaii, Bering, and the assorted Daylight Savings, Double Daylight, and what-have-you times.

India recently moved her eastern clocks back half-an-hour and her western clocks ahead half-an-hour, unifying time across the entire continent, while much smaller Alaska, not even an independent country, had divided itself into four time zones.

All of South Africa, white and black nations alike, are on the same time, from the Atlantic to the Indian Ocean, while Australia lives in three time zones, the center thirty minutes behind the east, but ninety minutes ahead of the west!

Obviously, the question of what time it is, or what time it should be, is one for debate. While there must be some method of compensating for different sun-positions at different locations about the world, there is some question as to whether or not this is necessary or even desirable, where one country is concerned, even when that country is as large as the United States.

Our system of different time zones goes right back to the early days of western exploration. In those days noon was the time when the sun was directly overhead in whatever city you happened to be in, so there were virtually as many time zones as there were cities. Then came two new factors into the what-time-is-it equation, the telegraph and the railroad.

Communications has been the backbone of expansion, and without any standardized time, communication with some became almost impossible. Equally impossible was rational scheduling of the railroads, when the departure point and

Where the sun was in relation to the clock was important when men rose with the sun and slept at nightfall, but a rational national time is now more important than natural illumination. How many people do you know who go to bed when the sun sets, or get up when it rises?

the destination might be on times 37 minutes apart, or 22 minutes apart, or almost any other figure. Something had to be done, and it soon became obvious that any solution had to be world-wide, for the problem was world-wide.

In 1883 International Conventions were signed setting up world-wide time zones, and, for internal use, the United States adopted four time zones, Eastern, Central, Mountain and Pacific. In 1883 it took approximately one full day to travel across one full time zone, so the

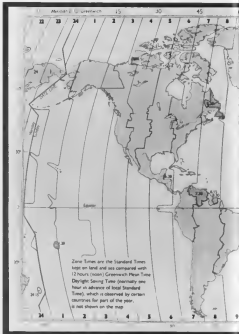
solution was, in 1883, practical.

Today you can cross one of those time zones in an hour or less, which has played havoc with both business and housewifery's digestion, but we've managed, since 1883, to add still another screwball factor to the time zone problem: Daylight Savings Time.

During the second world war, to increase the productive hours, we moved the clock ahead one hour nationally. After the war ended Daylight Savings Time didn't go away—nor did it con-

tinue. Instead there was a little of each, as some locales retained daylight savings, and some didn't. Some used it only in summer, some year-round, and some not at all. The confusion this caused in both business and personal life would be hard to describe.

In 1967 Congress passed the Uniform Time Act, which divided the U.S. into eight time zones, Atlantic, Eastern, Central, Mountain, Pacific, Yukon, Alaska/Hawaii, and Bering. The act also made daylight savings time mandatory







Aside from opening up the exploration of the New World, the Spanish conquest of the Aztec Empire also managed to destroy centuries of hard-gained knowledge.

AZTEC MEDICINE

article/Raymond Friday Locke

It has been stated, a great deal more in truth than in jest, that at the time the Europeans first came to the New World a man took but two baths in his life, at his birth and on the eve of his wedding day.

True, of the European man.

But when Cortés and his ragtag army of Spaniards marched into Central Mexico and confronted the mighty Aztecs, it was *required by law* that citizens of that New World empire bathe each and every day.

After several months of brilliant military and political maneuvers, Hernando Cortés and his Spanish soldiers were finally "scored into the busy tale city of Teaochitlan." Their escorts, soldiers and high born princes of the empire, were not only freshly bathed and wore clean clothing in honor of the foreign visitors, but they also used an underarm deodorant that consisted of a mixture of herb juices, crushed bone and ground up sweet smelling flowers. The Europeans were truly from another world, for an underarm deodorant was beyond their comprehension and the lye soap with which they were familiar—and oil-

dom used on their bodies—still smelled like lye soap—rancid.

The Spaniards, themselves, very probably smelled like a herd of goats as they mentioned later that the "savages" kept swamping burners of sweet-smelling incense about them. Upon their arrival in the city they were housed in rooms where still more incense burned and upon the floors of which had been strewn "goodly smelling" flowers. Moctezuma II, King of the Aztecs, bathed four times each day and changed his clothing as often. He was trying to tell Cortés and his soldiers—the "flower of European manhood"—a thing or two, but it really didn't register. Nor did it impress the Aztecs when, in turn, the Spanish priests told them of the new Christian god in whose image they said they'd been created. An abstract god who had created such rank-smelling men was an abomination in the eyes of the proud—and clean—Aztecs.

The Spaniards' "heathen" hosts were also unimpressed by the table manners of their guests, who wolfed down their food with hands blackened by dirt and whatever else had been recently handled.

In the poorest of Aztec homes cotton napkins and ewers of water were placed before doors, and the venerable ceremony of ablution was punctuously observed both before and after eating.

It has been said that the Aztecs were obsessed with cleanliness, and perhaps they were. On the other hand, their attentions to personal hygiene could be interpreted as a manifestation of a society advanced in many aspects of the medical arts. It can be safely said that the Aztecs, at the time of Cortes' conquest and destruction of their civilization, were four hundred years ahead of European medicine, especially in the knowledge and use of anesthetics, pharmaceuticals and the treatments of many physical disorders and diseases.

We will not go into the minute details of Cortes' military conquest of the Aztecs here. But we will point out that, while the Spaniards did, indeed, as the history books teach us, conquer the great empire with only 553 European soldiers pitted against an army of 150,000 or more at Moctezuma's disposal, he was only able to do so with the aid of thousands of Indian allies and through the Aztec leader's fear that he was the god Quetzalcoatl returned.

Two contrasting images of the Aztecs have come down to us through history. On one hand is the image of long lines of doomed human sacrifices, drugged and marching up lofty temples to be spread-eagled and slashed open with an obsidian knife wielded by priests with hip-long, blood-matted hair. Thousands were sacrificed to the various gods of the Aztecs and to the firm belief that the fuel of human hearts kept the life-giving powers of the sun shining on Mexico.

On the other hand, there is the description of Tenochtitlan left behind by Cortes and his Spaniards. They were so awe-stricken by their first sight of that beautiful, shining city, built in the center of Lake Texcoco and connected by the mainland by a series of causeways, that they were dumbfounded. Bernal Diaz del Castillo wrote later that upon sighting Tenochtitlan "we were amazed and did not know what to say. Some of the soldiers asked whether the things we saw were not a dream . . . there were things that had never been seen before nor heard of, nor even dreamed about."

Tenochtitlan, with its magnificent palaces of white and flintmasonry colors, with its canals criss-crossing the city, with its huge courtyards, roof gardens, fountains and pools, with Moctezuma's

jasper-pillared palace with acres of rooms and with its one thousand street cleaners busily sweeping it all clean of the last speck of dust, would be a staggering sight even today. Little wonder it left the Spaniards used to their crowded, filthy cities, with mouths gaping. And in the outlying countryside there were huge villas and elegantly landscaped estates upon which was practiced a higher level of agriculture and horticulture than anything known in the old world. It amazed Cortes of Venice—but he would destroy it all, including its treasure archives and libraries of codices that contained all of the knowledge and history of the Aztecs, as well as that of other Indian nations with whom they had come into contact. He would also destroy the clearly demonstrated scientific progress of the Aztecs as well as their culture, a culture that gave privileged status to poets, painters, sculptors and other artisans.

It was only from a distance that Tenochtitlan reminded Cortes of a more magnificent Venice. Up close it bore little resemblance. The canals of Tenochtitlan were as clean as a mountain stream; those of Venice were then, as now, little more than open sewers where the refuse of human habitation was dumped. It was forbidden by law to dump refuse of any sort into Lake Texcoco or any of the canals which interlaced the city. Public latrines were unknown in Europe at the time, but they were not only commonplace in Tenochtitlan and other Aztec towns, but were also connected at intervals along the causeways. Sanitary workers emptied and cleaned them daily and the refuse was taken to the mainland, along with that from private homes, to be utilized as fertilizer on the farms.

In spite of the fact that the Aztecs kept their canals and Lake Texcoco sparkling, they did not secure their drinking water from that source. At the time of Cortes' arrival, the entire population of Tenochtitlan, at least 300,000 and perhaps half again that many more, obtained their drinking water from a public water works that consisted of two clay-piped aqueducts that brought fresh water from the springs in the mainland hills. In European cities of that era water for home consumption was obtained from the river upon which the cities were invariably built—and sewage was dumped into the same river. This practice, we need not point out, is still commonplace, not only in European cities today, but also in most American cities that front large rivers or lakes. Most

European city water supplies were so contaminated in the Middle Ages that children, as a matter of course, were weaned on beer or wine. Plagues and pestilences periodically decimated the European cities, in Tenochtitlan they were all but unheard of. Until the Spaniards came.

Aztec public health and welfare were so far advanced over that of Europe that a comparison is almost unfair. The comparison is like the care taken of the American Astronauts—representing the Aztecs, of course—to that given to the patients in some of the United States notoriously inadequate mental hospitals. In Europe the blind, the poor, the crippled and orphaned children of tender age managed the best they could in an uncaring society, begging and scavenging in the dark, rat-infested alleyways of the cities. Even children whose parents were employed most often worked themselves, victims of an apprentice system that required that they begin learning a trade at the age of six or seven. Veterans, wounded, maimed, or blinded in the service of European kings, were usually abandoned and forgotten, forced to seek a living at begging or as best they could.

But in Tenochtitlan and other cities of Central Mexico there were homes and hospitals for veterans, staffed by state paid physicians and surgeons. There they were cured for when they were ill and there they were housed as long as they lived if they were unable to work. Actually, the Aztecs were the true pioneers of socialized medicine, for the government not only supported hospitals for veterans, but also gave medical care to civilians who were unable to pay for the services of private doctors. With our prevailing chauvinistic attitude toward our European blood culture we might suppose that the patients in Aztec hospitals were cured for by "witch doctors." On the contrary, practitioners of Aztec medicine were men in advance of their European counterparts in many areas. Even Cortes' Spaniards admitted that the medicine as practiced in Mexico was well advanced beyond that of Europe in some if not in most, fields. In at least two areas they were centuries advanced. In the almost unmeasured cleanliness and in the employment of medicinal herbs.

The use of herbs to treat wounds and any of a variety of ailments so impressed Europe that soon after the conquest several learned treatises on "Aztec herbs" and the "plans of New Spain" made their appearance. It is from these that our small knowledge of Aztec herbal

While Europe was just emerging from the dark ages, with medicine mere superstition, the Aztecs were medically in the 20th Century.



medicine has been passed down. Unfortunately, the Europeans who authored them were more taken with the bizarre than they were with the practical.

The Aztecs believed that certain stones—particularly gall, kidney and other concentrations found in animals and birds—possessed curative powers. And so did the Spanish who sought the useless stones as avidly as they did the Aztec gold, silver and minerals. The desire for such stones, set in precious metals, polished and suspended from charms, became the rage of Europe. They were thought not only to cure certain

diseases, but also were credited with being able to absorb poisons—and especially those poisons which Europeans were constantly and surreptitiously putting in each other's warts in those days.

While all of Europe took to the use of the Aztec's lendings for gallstones, the enlightened citizens of that far land probably laughed when they were told of the Indians' habit of using dried excrement of certain animals and birds to treat wounds. Modern medical practitioners, their craft still steeped in the European background, finally

stopped laughing at the primitive cure when the miracle drug penicillin was isolated from mouldy chicken excrement earlier this century! Too, the Aztec use of nettles, ant and scorpion venom to treat arthritis and other diseases of the bones parallels some modern therapy.

The Aztecs treated both diarrhea and constipation effectively with various herbs, they controlled asthmatic spasms, bronchial infections and laryngitis with junco weed, a narcotic and antispasmodic, they derived astragals from various plants, notably the green papaya, for the treatment of various skin diseases and conditions and they snuffed pungent herbs for the relief of the common cold. They also drank water that had been steeped in willow leaves for, as a modern television peddler might say, "the relief of the aches and pains of the common head cold." Willow leaves contain acetylsalicylic acid, which is known as "aspirin" to modern pharmacists!

Four hundred and fifty years ago the Aztecs devised a salve with the same components of a "well-known preparation" used today in treating hemorrhoids. The citizens of Central Mexico, though, were seldom bothered with hemorrhoids and used the salve to treat snake cuts in their skin and cracks in the soles of their feet. The Aztecs had effective treatments—no one degree or another—for hepatitis, nose bleeds, heart disease, deafness and many, many other ailments.

The employment of various narcotics as anesthetics was common practice in Aztec Mexico, used in the relief of pain resulting from injuries and wounds, during operations and, yes, to drag sacrificial victims beyond reason. Modern (i.e. European derived) medicines did not stumble upon the use of ether until the middle of the nineteenth century and did not really begin an extensive use of pain-relieving drugs until World War I!

For two very good and very simple reasons: the recovery factor of Aztec patients, and particularly those requiring surgery, must have been infinitely higher than in Europe—the use of anesthetic drugs, alleviating much pain and the subsequent shock, and cleanliness which, of course, alleviated infections. All Aztecs were obsessed with cleanliness, and the surgeons were no less so than anyone else. In his excellent *Medicine in Mexico* (1968), Gordon Schendel pointed out that in Tenochtitlan "clean doctors with clean hands operated upon clean patients in clean surroundings."

"Whereas in some European
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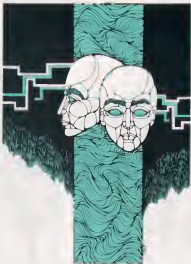


I MIND

fiction/Allan Asherman

art/C. Lee Healey

He was locked inside his mind, alone in a world that hated him, then, suddenly,
there was a ray of light.



The contact could be a trick, and if it was, he was smart enough to know that acknowledgement of the contact would mean his death.

Mind-Verb-To use the invulnerable and treacherous powers of telepathy that are congenial in random and ever-increasing cases

—Wrightson's International Dictionary

I look through the window next to me and try to imagine that I am skimming over the City independent of the Overway Car. The air is cool and brushes past me, and there is no sound of engines, just the whoosh of freedom as I move and look and feel what is beneath me. I fly alone, and I need not worry for I can go wherever I wish. But I must never land, or the clean and small buildings would become overwhelming, translucent hands that would struggle to carry me down into the dirt that cannot be seen as I fly. Turbulence!

Turbulence is unexpected, and it shocks me. I am back in the Overway, flying along the route mapped out by the schedule-maker. I have memorized it, and it does not surprise me.

I must be alone. It is not a pleasant thing, but it is safe. I am safe. Not like the old times when you had to sit looking at the people directly opposite you. I can continue to look out the window. I must not see the human faces, nor the old mothers, nor the young women I would like to see. For if I look I shall see, and if I see I shall be finished.

It doesn't take too long to fly from one part of the City to the next. It's not long at all. The trip used to take much longer, when the cars were on tracks and they skidded the ground instead of the air.

The man beside me is wondering if his wife is seeing another man. No. He is sure she is, but he is wishing she was not by sitting and wondering if what he knows to be the truth is the truth at all. If I could only say something that would make him feel better, but I cannot, he must not know I am minding his secrets. No one must know I am minding at all.

But I do mind, as others speak or smell or hear or wonder. I mind as others mind and hide from the world and others of their own kind. Their lives would end if they did not hide from the Non-minders. The Non-minders who make the laws and who are afraid of the Minders, who cannot hope to hide from us as we hide from them.

It is a gift I was born with, that we were born with, this thing of minding. It was something that always stood in the back, in the dark, saying nothing. Until my first course in "The Flowings of Civilization." He was a real sharp one, Teacher Butler. He could spot your head moving even if he was facing the other side of the room. The test was hard. The only thing I could do was to hope I really did know the answers. I tried to look at Vivian's paper. Vivian always knew the answers. Then, suddenly, I did too. I remember trying to figure out the answers, then trying to figure out how I knew them. Suddenly I just knew where to put the scratches in the plastic answer-strip. I remember how I felt, when I realized what I had done, what I could do whenever I wished. To whomever I wished I could look into people, I could see, I could know. . . anything I could mind.

I suppose that anyone who can't mind would ask why I don't use my power of minding to get anything I want. I guess I could do that. There are no secrets. If there are, I just look and question silently, and I know the answer. No secrets where a Minder is concerned. It's like being a father in a world of children. I only wish the children knew that.

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*There is nothing more useless
than a hero in a safe society.*

À LA MODE KNIGHTS

Action/William Rotzler
art/Tim Kirk

Listen, why don't we make love?" the Hero asked the Heroine. You know why," she said, tossing her raven locks.

The Hero nodded sadly. "God damn it," he muttered, "sometimes I wish I had taken that job as a sex book hero."

"What?" the Heroine exclaimed, looking up at him through the cascade of golden hair. "And blow all that training? You'd throw away all those hours you spent learning how to spot weld hubbers and read crudely drawn maps? Not to mention Jaw Rippling. You got an A in Sissie's Looks, remember?"

The Hero shook his head wearily. "Ah, they don't do that stuff anymore. I haven't saved a solar system or dugged it out with a Bag-Eyed Monster in ages!" He looked up brightly and grinned his lop-sided grin. "I did find a jug of vintage Xeno in a reprint last month!"

The Hero rubbed his pensive eyes wearily. "They're so damned venous nowadays. Jews, I remember when the Captain, Krag, and I used to hang out together after work, trying to make out with Sheena and Dale and Wilma Whashermans. Those were the days."

Archly, the Heroine ran her fingers through her fiery hair, asired as the sands of distant Mars. "Do you know Wonder Woman?" she asked.

"Now, she hang out with a different crowd. They drink vodka martinis and talked about vaginal nystagmus and stuff like that. They seemed to resent me."

The Hero straightened his broad shoulders and took a brich at his gunbelt. "Back in the good old days we used to know what we were doing. No matter how bad things got you knew you'd win out in the end. But, today, Christ, sometimes you aren't sure the adventure is over until you bark your skins on The End." He shook his head wearily. "I've stood around in the trenches like a comic relief character by a neopysie more than once, waiting for the okay to go home. I mean, I wasn't sure the story was over or not. It had stopped, yerk, but it hadn't ended!"

The Hero nipped his jaw muscles and looked grim. "Great Gernsbach, sometimes I'm not even certain I'm the Good Guy or not! Can you imagine that?"

"Is that a freebie apple, or are you just practicing?" the Heroine asked.

"Sometimes I think I ought to get into some other line of work. Oh, I know the sex book hero has a lot of action and the dialogue is pretty monotonous, but at least you know what you're doing!"

But I want to be liked for something other than *desir*! Maybe I ought to try selling my story to the *Internationale Enquirer*, or maybe go over to Europe and look up some of the comic strip fellows. I ran into Flash the other Sunday and he said there are a lot of openings over there for bright new talent. It's a big comic revival, you know."

Listen, you think you have problems," the Heroine snapped, her nostrils flaring and her eyes flashing. "How would you like being carried off by some ugly bastard of a BEM, huh? Goddamn powers! What the hell do they do it for, anyhow? God knows they cop enough fails, but I mean, really, do they expect me to get all hot over some buncha tentacles or fifty-seven eyes?"

"Well, hey, grappling hand-to-hand with some of those stoney devils ain't so great, either. At least you faint most of the time and just sort of hang there, getting a free ride while I have to go on, despite the flesh wound."

The Heroine brushed back her blue-black hair and looked over at the Hero angrily. "Oh, yeah? What about all the times I used to get set up and all those chains and things?"

"I always go to you in time, didn't I?"

"Well, usually, but those Bag-Eyed Mothers used to have the most awful breath! Smelled like old pulps rotting in a garage!"

"I suppose you like it better these days?" the Hero inquired.

"Heroes don't *snort*," she said. "Ask angrily or question silently or something. My god, no wonder you are having a hard time of it!"

"Never mind how I use my mouth, answer the question!"

"Certainly I like it better now. I get to wear some decent clothes instead of those lard-jump suits and those cockamamie sun-wrap spaceuits! Can you imagine what bronze bra cups do to your breasts? You, you get to wear something comfortable, but I used to freeze my ass in those Male Chauvinist costumes!"

"Yeah, sure, sure, but there was adventure in those days!"

"Adventure?" You had adventure, I had nothing! How would you like it if all you did was deliver lines like 'Take care of yourself, darling' and 'Ezek'?" I mean, really? We used to get carried off and held by the villain—and you know those guys, they think that gives them the right for a little hanky-panky back around the correspondent school

ads.

"I spent more damn time warring while you hero types went off getting some exercise! And who did I wait with? Not some young stud or even some guy you could rock to, but robots, brains in plastic boxes, friendly aliens who ask you dumb astrophysical questions, and second leads! Listen, have you ever met a second lead you'd like to go to bed with? I mean *even once*?"

"Well, there was Princess Aura..." "Oh, yeah? She bleaches her skin yellow. She used to be bright cadmium yellow, remember? That bitch is passing, goddamn!"

"She's a fox chck, though. Why, I remember once, when I was understudying Flash during the Tournament of Death. She gave this party, and wow, there was this dancer who—"

"Is that all you think about?"

"Whaddya mean? You were just complaining about how nobody laid a hand on you in the old days, just tentacles, claws, fippers, and other obscene appendages."

"But look at you, mawnyng over some dancer from thirty years ago! All that stuff is dead and gone."

"Not in Europe it isn't," the Hero said. "Over there they've got some respect for the traditions of adventure and heroism. I mean, you can walk down a Sunday page and they smile at you and step off the panel to let you go by."

"That's the comics, big boy. That's the *Shed Row* of adventuring."

"It is not! It's the last stronghold of Heroes! Real he-men, all of them!"

"They look like a buncha fags, running around in skin-tight orchid-colored tights. For Christ's sake, that's not for *you*!"

"But I'm going bald just sitting around, waiting for a call. I practice different makeup and I try out some of the new phrases, you know, those analytical dis-sentiments on the ad or something. I plan to be ready for anything that comes my way. I'm up for a serial in *Analog*, if I can pass my computer test, and there's a chance for me over at *Amazing* in a couple of months, if that damn writer stays sober."

The Heroine said, "Sure, sure, I know the routine. Don't call us, we'll *wow* you. Listen, I turned down a lead in *Cosmo* de *Sade* and *The Pleasure Planet* last week. Starring role, too, I mean, after the *Cosmo* bit. But I've had it with being tied up. It's too confining and all you get are deathless lines like 'No! Never!'

and 'Moarph'?"

The Hero nodded sympathetically. "Listen, I know how it is. Have you thought about taking a job with a porno house?"

The Heroine brushed her Kamias wheat hair gleaming. "What kind of girl do you think I am? Besides, they never asked. I guess my type just doesn't appeal to them, the *crass masses*."

"Well, it's been nice talking to you," the Hero said, "but I have an appointment over at *Perver*. They want to look me over and maybe they can find something for me to do."

"Anything there for me?" the Heroine asked demurely, combing out her strawberry-blond hair.

"Come along and we'll see. You'll have to change into something suitable, though."

"You don't like my ruby red skintight with patent leather boots?"

"Now, you can't see the nipples. Listen, why don't you wear that little number you had on in last month's *Galore*?"

"Oh, keeping those damn floating bubbles to stay in place is a real drag. Maybe I could borrow something from Lieutenant Uhura, or something sensational from Barbarella. No she's too tall. Say, Steve Canyon's chick loves just down the page. I'll go ask her!"

"Okay, but don't take forever." The Hero nipped his muscles. "I'll just do a few of the old numbers while I'm waiting."

"No, wait, I have something just right left over from the last time I played The Mad Scientist's Daughter."

"Okay, but hurry it up. We have to make our entrance on time."

"We're professionals, darling. We always make it on time."

"Say, eh, maybe afterwards you and I

"You mean *Later*, *cosmo*?"

"Sure, why not? It would be the perfect example of keeping up with the times."

"Well, it needn't be too graphic."

"That's the kid! It's you and me, together again! Old wine in new bottles!"

"Six days a week and in color on Sunday."

"Once a month in every magazine on the stands!"

"What about original anthologies?"

"Anything you want, baby? Stick with me and you'll be wearing a four-color wardrobe and getting plenty of close-

ups!"

"I'm yours!"

"Darling!"

"I get top billing, of course, this being the age of Liberation."

"Over my dead prose!"

"Equal billing!"

"You gotta stop hanging around with Wonder Woman."

"Yes, darling. Anything you say, *luv*. You're the boss."

"Only as long as most writers are male."



*"Archly, the Heroine
ran her fingers thru
fiery red hair, red as
the sands of distant
Mars. 'Did you know
Wonder Woman?' she
asked the Hero."*

Doctors Benford and Coleman, top scientists, find science fiction is the "thinking man's" literature, or something like that.





VERTEX: How do you, as scientists, feel about science and SF?

COLEMAN: There are a lot of things to say about science and SF, but I think the important thing is that they are very very different sorts of things. Of course, SF uses science, but it uses it for all sorts of complicated purposes and transforms science in the process of using it much as I transform food in the process of using it. I think there is a terribly naive belief, a really awful error, that in some sense the science is in SF like a passenger is in a car—that just isn't so.

BENFORD: Yes, I agree that it is not a passenger, it is actually part of the mechanism. Good science SF is like an iceberg. Ninety percent of the background is not showing, but you can sense it if the writer has failed to provide it. That is why I think that, although SF is not deductive, you don't learn things about nuclear physics or biology from it, you can certainly get a feeling of what the scientific process feels like.

COLEMAN: I think that's a great point about the tip of the iceberg, because one function science can serve in SF is giving the writer that invisible background necessary to give his imagined world a feeling of solidity. It's true you can do this with imagination and hard work by just inventing an enormous background that doesn't appear in the story, as Asimov Davidson is doing for his *Virgil* Mega stories, but you can also use the existing body of scientific knowledge as that invisible remainder of the iceberg that gives the feeling of coherent validity.

VERTEX: Can you boil that down to about a sentence and a half?

COLEMAN: An SF writer can use science the same way Dante used the world of medieval theology.

BENFORD: To infuse every particle of the work without being obtrusive.

COLEMAN: Tolkien did that sort of thing with the languages he created for the *LORD OF THE RINGS*. He created them by working backwards, which he was quite competent to do, since he is a philologist.

BENFORD: World-spanning is a thing which is common to all fiction, but it is most strongly seen in SF and fantasy.

COLEMAN: One of the effects SF can give—that is almost impossible to do outside of SF—is the cosmopolitan game. The game of giving birth to a created world at least as rich and coherent as the real world. That's a kick!

VERTEX ROUNDTABLE INTERVIEWS DR. SIDNEY COLEMAN AND DR. GREGORY BENFORD

Interviewer/Paul C. TURNER

Despite the fact that he is only 35, Dr. Sidney Coleman has been teaching at Harvard University for over ten years, and he is now Harvard's

Professor of Theoretical Physics. Originally from Chicago, he received his doctorate from Cal Tech. His specialty is the origin of particles, and Greg Benford (see below) says "He is known as Count Example Coleman, for he has destroyed a lot of theories by finding counter examples, showing where the ideas have failed."

Dr. Coleman teaches a great deal, both for pleasure and to lecture throughout the world at various universities and scientific conventions, and he is a very well-known personality in the science fiction field.

*Dr. Gregory Benford, a frequent contributor to VERTEX, received his Ph.D. from the University of California at San Diego, then went into research while holding the position of Associate Professor of Physics at the University's Irvine Campus. He is currently engaged in research on controlled thermonuclear fusion for the Atomic Energy Commission. Dr. Benford has had two science fiction novels, 30 short stories, and many science articles published, and is the co-author of the forthcoming textbook, *Antimatter and Life in the Universe*.*

"Some of the pleasures that you get out of science you also get out of SF. This is something special to me and Greg and other working scientists."



VERTEX: I have heard SF writers referred to as prophets.

COLEMAN: I deny SF as prophecy. Prophecy *qua* prophecy has a bad track record.

BENFORD: They are prophets only in the sense that the man who operates a shoogun is a marksmen. You can try to anticipate the possible range of futures, but you can't predict *the* future. The future is only one thing. The game of SF predicting the future has had a track record so bad that it didn't even anticipate the social circumstances or outcome of the space program.

COLEMAN: Who anticipated real-time television communication with the first man on the moon? There must have been a thousand stories written about the first moon landing, and in not one of them, to my knowledge, were the people on the moon being watched by a million families on their home television sets. Who anticipated the Russians sending up Sputnik? That was something not anticipated in the United States—that the Americans would not be the first in space.

VERTEX: It is interesting to note that the way we went to the moon wasn't anticipated either. No one thought of a lunar landing module, for instance, it was always one space ship. SF spacecrafts landed on the moon's surface and then returned to land on

Earth. I don't know of a single story where it was a modular approach, or one where systems analysis was anticipated, even though systems analysis was the tool used to develop space flight.

COLEMAN: There are exceptions, such as Arthur C. Clarke's *PREFLUDE TO SPACE*, which understands that any moon project will be a very very large scale, necessarily bureaucratic endeavor. On the other hand, there is *ROCKETSHIP GALILEO*, by Heinlein, which, as I remember, involved three boys and their uncle building a rocketship in their backyard and flying to the moon.

That was written when—1947?

BENFORD: One is influenced more by dreams than by realities.

VERTEX: But isn't that one of the major functions of SF? To blow the mind, to really expand all the senses?

COLEMAN: That's another correlation between science and SF. Some of the pleasures that you get out of science you also get out of SF. This is something probably very special to me and Greg and other people who are actually working scientists, but, I assure you, one of the reasons for doing science, especially the kind of science I do (elementary particle physics, high energy theory) is that it makes your head feel funny. God-damned-strange. That's also the feeling I get out of SF.

There's a great saying: The future is not only stranger than we imagine, but stranger than we *can* imagine. For example, something like quantum mechanics or the theory of relativity are much stranger, much more mind-busting, than anything in the way of philosophical speculation. Truth, in fact, is much stranger than fiction in a funny way.

Now you have to ask, why did people think of these strange ideas? They thought of these ideas because they were under external constraints. In the case of relativity it was the constraint of explaining experimental reality. It seems to be a fact of the way the human mind works that your imagination functions better if it is constrained than if it is free. One of the functions of trying to make an SF story consistent within itself is that it seems to inspire people to heights of disciplined imagination that they just can't get to without these constraints. I think that is an important function of science in SF. It serves the same function that the rigid metrical structure of the sonnet does in poetry.

In at least one sense there is a peculiar point of tangency, in that some of the pleasures of actually doing science are also some of the pleasures of actually reading good SF. Not necessarily accurate or hard-science SF. For example, one of the writers who does this for me most frequently, who gives me the same sort of pleasure that I get from understanding a great scientific discovery or making a small one of my own, is R. A. Lafferty.

VERTEX: Dr. Benford, when did you begin reading SF?

BENFORD: 1948 or '49. I was seven or eight.

VERTEX: Do you think it influenced you in your choice of profession?

BENFORD: Oh, yes. One of the first things I ever read was *ROCKETSHIP GALILEO*, by Heinlein, and it seemed to me that it had a larger dimension than the other books I was reading, which were all set on farms or were about people taking streetcars to places. It just had a larger canvas, and I found it more interesting.

COLEMAN: I started reading SF in early 1951 when I was 13 years old, and I have been reading it steadily ever since. The first thing I ever read was *NEEDLE*, by Hal Clement, and I thought it was a marvelous book. The second thing I read was *THE WORLD OF NULL A*, by A. E. Van Vogt, and I thought it was a

"A SF writer can use science the same way Dante used the world of medieval theology."



fantastically good book

BENFORD: And you were wrong **COLEMAN:** Well, I've modified my opinion somewhat. I still think it is a fantastically good book in many ways. The third thing I read was the *BIG EYE* by Paul Erlich, and I thought it

was loopy.

VERTEX: Dr. Coleman, did SF have anything to do with your choice of profession?

COLEMAN: No, I had already decided at that time that I wanted to be a scientist. I don't think that my reading of SF has had much influence on my professional life. Of course, my general interest in SF has had an enormous influence on my personal life. I don't think you can feed that much of any kind of literature into your head without it influencing you in indirect and subtle ways. I wouldn't be sitting here talking with you, or have half the friends I have, were it not for SF.

BENFORD: Same here, about the friends.

VERTEX: From your special point of view, as scientists, do you think hard-science SF is more important than soft-science SF?

BENFORD: No.

COLEMAN: That would lead us to the ludicrous position of saying that Hal Clement is a more important writer than A. J. Badrys, which I don't think any of us, no matter how fond we are of *MISSION OF GRAVITY*, would want to say. Surely that's not true.

BENFORD: I think that, as a writer, clearly Badrys was superior.

COLEMAN: Yes, I agree.

BENFORD: But as a person who influenced the thinking of a lot of people, Hal Clement may be more important, simply because most scientists that I know were influenced by SF at an early age, and they read people who wrote hard SF.

COLEMAN: You mean that's what turned them into scientists, or made them interested in science?

BENFORD: No, I don't know if it's causal. I do know that there is a clear correlation.

VERTEX: Perhaps they read science fiction because they are interested in science, not the other way around.

COLEMAN: I was interested in science more than enough to become a scientist long before I ever read an SF story.

BENFORD: Probably most often the events occur simultaneously. SF is a way to get at the ambience of science—the thrill of discoveries. The kind of feeling of the way things work in distant fields shall we say. That is what is the balance of the facts that one learns in science? What is their impact on human beings? And it is necessary to have the science more or

"I think any flaw in a work of fiction, any flaw visible to a reader, tends to discredit the whole work."



less correct if you are going to make the right guesses about the impact of science and its resultant technology on people.

VERTEX: What about most of the scientists you know—do they read SF?

COLEMAN: No, many of them read it when they were teenagers, but they've abandoned it now.

BENFORD: I might add that most scientists I know have abandoned almost all reading.

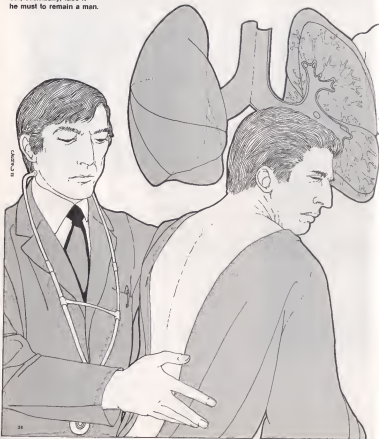
COLEMAN: Some I know are quite literary and cultured people, but I would say only a small proportion read SF. SF is a genre that makes a tremendous first impression, because of these ideas which have been developed within the community of SF. All the little twists and turns of time travel or how to make up faster than light spaceships or how to run a galactic empire. They're all there. They're common property. But if you've never heard of SF and you pick up a copy of *AMAZING* or *ANALOG* or *VERTEX*, all of these things burst upon you. *WOW!*

FANTASTIC! Very rich. Thousands and thousands of new ideas. It comes back to the thing that Moscovitz was always yammering about: the sense of wonder. SF is very good at giving you that sense of wonder. To the people in this room, of course, these aren't new ideas. They are clichés with maybe

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Each man must face the
test of courage in his own
way and in his own time,
but, eventually, face it
he must to remain a man.

CASTRO 18





The bravest man I ever saw in my life!" Jones said, being rather shrill about it.

We—Jones and Arkwright and I—were walking toward the parking lot at the close of visiting hours out at the veterans hospital. Wars come and wars go, but the wounded we have always with us—and damned little attention they get between wars. If you bother to look (few do), you can find some broken human remnants dating clear back to World War One in some of those wards.

So our post always sends out a visiting committee every Sunday, every holiday. I'm usually on it, have been for thirty years—if you can't pay a debt, you can at least try to meet the interest. And you do get so that you can stand it.

But Jones was a young fellow making his first visit. Quite upset, he was. Well, surely, I would have despised him if he hadn't been—the crop was fresh in from Southeast Asia. Jones had held it in, then burst out with that remark once we were outside.

"What do you mean by 'bravery'?" I asked him. (Not that what Jones had plenty to back up his opinion—this lad he was talking about was shy both legs and his eyesight, yet he was chin-up and merry.)

"Well, what do you mean by 'bravery'?" Jones demanded, then added, "or 'Respect for my white hair' rather than my opinions, I think. There was an edge in his voice.

"Keep your shirt on, son," I answered. "What that lad back there has I'd call 'fortitude'—the ability to endure adversity without losing your morale. I'm not disparaging it—it may be a higher virtue than bravery—but I define 'bravery' as the capacity to choose to face danger when you are frightened by it."

"Why do you say 'choose'?"

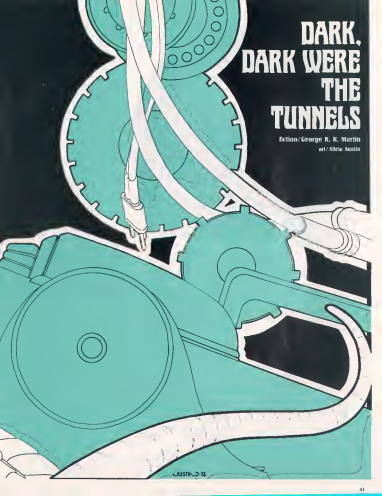
"Because nine men out of ten meet the test when it's forced on them. But it takes something extra to face up to

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NO BANDS PLAYING

Fiction/Robert A. Heinlein
art/Alecia Austin





DARK, DARK WERE THE TUNNELS

Editor/George R. R. Martin

art/Albia Audio



The great hunting rat had no eyes, but his scent was keener than Greel's, and there was a strange smell in the tunnel. His ears were better, too. Through them Greel would pick up more of the odd noises that came from within the fire that was not a fire.

GREEL WAS AFRAID

He lay in the warm, rich darkness beyond the place where the tunnel curved, his thin body pressed against the strange metal bar that ran along the floor. His eyes were closed. He strained to remain perfectly still.

He was armed. A short barbed spear was clutched tightly in his right fist. But that did not lessen his fear.

He had come far, far. He had climbed higher and ranged further than any other scout of the People in long generations. He had fought his way through the Bad Levels, where the worst things still haunted the People silently. He had stalked and slain the glowing killer mole in the crumbling Middle Tunnels. He had wiggled through dozens of unmapped and unnamed passages that hardly looked big enough for a man to pass.

And now he had penetrated to the Oldest Tunnels, the great tunnels and halls of legend, where the tale-tellers said the People had come from a million years ago.

He was no coward. He was a scout of the People, who dared to walk in tunnels where men had not trod in centuries.

But he was afraid, and was not ashamed for his fear. A good scout knows when to be afraid. And Greel was a very good scout. So he lay silent in the darkness, and clutched his spear, and thought.

Slowly the fear began to wane. Greel steeled himself, and opened his eyes. Quickly he shut them again.

The tunnel ahead was on fire.

He had never seen fire. But the tale-tellers had sung of it many times. Hot it was. And bright, so bright it hurt the eyes. Blindness was the lot of those who looked too long.

So Greel kept his eyes shut. A scout needed his eyes. He could not allow the fire ahead to blind him.

Back here, in the darkness beyond the bend of the tunnel, the fire was not so bad. It still hurt the eyes to look at it, as it hung upon the curving tunnel wall. But the pain was one that could be borne.

But earlier, when he had first seen the fire, Greel had been unwise. He had crept forward, squinting, to where the wall curved away. He had touched the fire that hung upon the stone. And then, foolishly, he had peered beyond the curve.

His eyes still ached. He had gotten only one quick glimpse before whirling and scrambling silently back to where he lay. But it was enough. Beyond the bend the fire had been brighter, much brighter, brighter than ever he could have imagined. Even with his eyes closed he could still see it, two dancing, aching spots of horrible atomic brightness. They would not go away. The fire had burned part of his eyes, he thought.

But still. When he had touched the fire that hung upon the wall, it had not been like the fire of which the tale-tellers sang. The stone had felt like all other stone, cool and a little damp. Fire was hot, the tale-tellers said. But the fire on the stone had not been hot to the touch.

It was not fire, then, Greel decided after thought. What it was he did not know. But it could not be fire if it was not hot.

He stared slightly from where he lay. Barely moving, he reached out and touched Hsug in the darkness.

His mind-brother was several yards distant, near one of the other metal bars. Greel stroked him with his mind, and could feel Hsug quiver in response. Thoughts and sensations mingled wordlessly.

Hsug was afraid, too. The great hunting rat had no eyes. But his scent was keener than Greel's, and there was a strange smell in the tunnel. His ears were

better, too. Through them Gisel could pick up more of the odd noises that came from within the fire that was not a fire.

Gisel opened his eyes again. Slowly this time, not all at once. Squaring.

The holes the fire had burned in his vision were still there. But they were fading. And the dinner fire that moved on the curving tunnel wall could be endured, if he did not look directly at it.

Still. He could not go forward. And he must not creep back. He was a scout. He had a duty.

He reached out to Hsing again. The humming rat had run with him since birth. He had never failed him. He would not fail him now. The rat had no eyes but could be burned, but his ears and his nose would tell Gisel what he must know about the thing beyond the curve.

Hsing felt the command more than he heard it. He crept forward slowly towards the fire.

A treasurehouse?

Cifonetto's voice was thick with admiration. The layer of protective grease smeared onto his face could hardly hide the grin.

Von der Stadt looked doubtful. Not just his face, but his whole body radiated doubt. Both men were dressed alike, in featureless grey coveralls woven of a heavy metallic cloth, but they could never be mistaken. Von der Stadt was unique in his ability to express doubt while remaining absolutely still.

When he moved, or spoke, he underlined the impression. As he did now.

"Some treasurehouse," he said, simply.

It was enough to annoy Cifonetto. He frowned slightly at his larger companion. "No, I mean it," he said. The beam from his heavy flashlight sliced through the thick darkness, and played up and down one of the rust-eaten steel pillars that sprouted from the platform to the roof. "Look at that," Cifonetto said.

Von der Stadt looked at it. Doubtfully. "I see it," he said. "So where's the treasure?"

Cifonetto continued to move his beam up and down. "That's the treasure," he said. "This whole place is a major historical find. I knew this was the place to search. I told them so."

"What's so great about a steel beam, anyway?" Von der Stadt asked, letting his own flash beam against the pillar.

"The state of preservation," Cifonetto said, moving closer. "Most everything above ground is radioactive slag, even now. But down here we've got some beautiful artifacts. It will give us a much better picture about what the old civiliza-

tion was like, before the disaster."

"We know what the old civilization was like," Von der Stadt protested. "We've got tapes, books, films, everything. All sorts of things. The war didn't even touch Luna."

"Yes, yes, but that is different," Cifonetto said. "This is reality." He ran his gloved hand lovingly along the pillar. "Look here," he said.

Von der Stadt moved closer.

There was writing carved into the metal. Scratched in, rather. It didn't go very deep, but it could still be read, if but faintly.

Cifonetto was grinning again. Von der Stadt looked doubtful. "Rodney loves Wanda," he read.

He shook his head. "Stat, Cif," he said, "you can find the same thing in every public john in Luna City."

Cifonetto rolled his eyes. "Von der Stadt," he said, "if we found the oldest cave painting in the world, you'd probably say it was a lousy picture of a buffalo." He jabbed at the writing with his free hand. "Don't you understand? This is old. It's history. It's the remains of a civilization and a nation and a planet that perished almost half a millennia ago."

Von der Stadt didn't reply, but he still looked doubtful. His flashlight wandered. "There's some more if that's what you're after," he said, holding his beam steady on another pillar a few feet distant.

This time it was Cifonetto who read the inscription. "Repent or ye are doomed," he said, smiling, after his flash melted into Von der Stadt's.

He chuckled slightly. "The words of the prophets are written on the subway walls," he said softly.

Von der Stadt frowned. "Some prophet," he said. "They must have had one hell of a weird religion."

"Oh, Christ," Cifonetto groaned. "I didn't mean it literally. I was quoting. A mid-twentieth century poet named Simon. He wrote that only fifty years or so before the great disaster."

Von der Stadt wasn't interested. He wandered away earnestly, his flash darting here and there amid the pitch black runs of the ancient subway station. "It's hot down here," he complained.

"Hotter up there," Cifonetto said, already lost in a new inscription.

"Not the same kind of hot," Von der Stadt replied.

Cifonetto didn't bother to answer. "This is the biggest find of the expedition," he said when he looked up at last. "We've got to get pictures. And get the others down here. We're wasting our

time on the surface."

"We'll do better down here!" Von der Stadt said. Doubtfully, of course.

Cifonetto nodded. "That's what I've said all along. The surface was plastered. It's still a radioactive hell up there, even after all these centuries. If anything survived, it was underground. That's where we should look. We should breach out and explode this whole system of tunnels." His hands swept out expansively.

"You and Nagel have been arguing about that the whole trip," Von der Stadt said. "All the way from Luna City. I don't see that it's done you much good."

"Doctor Nagel is a fool," Cifonetto said carefully.

"I don't think so," Von der Stadt said. "I'm a soldier, not a scientist. But I've heard his side of the argument, and it makes sense. All this stuff down here is great, but it's not what Nagel wants. It's not what the expedition was sent to Earth to look for."

"I know, I know," Cifonetto said. "Nagel wants life. Human life, especially. So every day he sends the flyers out further and further. And so far all he's come up with is a few species of insects and a handful of mutated birds."

Von der Stadt shrugged.

"If he'd look down here, he'd find what he's after," Cifonetto continued. "He doesn't realize how deep the cities had dug before the war. There are miles of tunnels under our feet. Level after level. That's where the survivors would be, if there are any survivors."

"How do you figure?" Von der Stadt asked.

"Look, when war hit, the only ones to live through it would be those down in deep shelter. Or in the tunnels beneath the cities. The radioactivity would have prevented them from coming up for years. Hell, the surface still isn't very attractive. They'd be trapped down there. They'd adjust. After a few generations they wouldn't want to come up."

But Von der Stadt's attention had wandered, and he was hardly listening any more. He had walked to the edge of the platform, and was staring down onto the tracks.

He stood there idly for a moment, then reached a decision. He snuffed his flashlight into his belt, and began to clamb down. "Come on," he said. "Let's go look for some of these survivors of yours."

Hsing stayed close to the metal bar as he edged forward. It helped to hide him, and kept away the fire, so he moved in a little band of almost-darkness. Hugging it as best he could, he

crept silently around the curve, and halted.

Through him Greel watched, watched with the rat's ears and with his nose.

The fire was talking.

There were two sounds, alike but not the same. And there were two voices. Just as there had been two faces. The bright things that had burned Greel's eyes were living creatures of some sort.

Greel listened. The sounds H'ang heard so clearly were words. A language of some sort. Greel was sure of that. He knew the difference between the roars and grunts of animals and the patterns of speech.

But the fire things were talking in a language he did not know. The sounds meant no more to him than to H'ang who played them.

He concentrated on the scent. It was strange, unlike anything he had encountered before. But somehow it felt like a man-scent, though it could not be that.

Greel thought. An almost man-scent. And words. Could it be that the fire things were men? They would be strange men, much unlike the People. But the teleclerics sang of men in ancient times that had strange powers and forms. Might not these be such men? Here, in the Oldest Tunnels, where the legends said the Old Ones had created the People—might not such men still dwell here?

Yes!

Greel started. He moved slowly from where he lay, raising himself to a crouching position to squat at the curve ahead. A silent snap brought H'ang back to safety from the fiery tunnel beyond the curve.

There was one way to make sure, Greel thought. Trembling, he reached out cautiously with his mind.

Von der Stadt had adapted to Earth's gravity a lot more successfully than Cifonetto. He reached the floor of the tunnel quickly and waited impatiently while his companion climbed down from the platform.

Cifonetto let himself drop the last foot or so and landed with a thud. He looked up at the platform apprehensively. "I just hope I can make it back up," he said.

Von der Stadt shrugged. "You were the one who wanted to explore all the tunnels."

"Yek," said Cifonetto, shifting his gaze from the platform to look around him. "And I still do. Down here, in these tunnels, are the answers we're seeking."

"That's your theory, anyway," Von der Stadt said. He looked in both directions, chose one at random, and moved for-

ward, his flashlight beam sweeping out before him. Cifonetto followed a half-step behind.

The tunnel they entered was long, straight, and empty.

"Tell me," Von der Stadt said in an offhand manner as they walked, "even if your survivors did make it through the war in shelters, wouldn't they have been forced to surface eventually to survive? I mean—how could anyone actually live down here?" He looked around the tunnel with obvious distaste.

"Have you been taking lessons from Nagel or something?" Cifonetto replied. "I've heard that so often I'm sick of it. I admit it would be difficult. But not impossible. At first, there would be access to large stores of canned goods. A lot of this stuff was kept in basements. You could get to it by tunneling. Later, you could raise food. There are plants that will grow without light. And there would be insects and boring animals too, I imagine."

"A diet of bugs and mushrooms. It doesn't sound too healthy to me."

Cifonetto stopped suddenly, not bothering to reply. "Look there," he said, pointing with his flashlight.

The beam played over a jagged break in the tunnel wall. It looked as though someone had smashed through the stone a long time ago.

Von der Stadt's flash joined Cifonetto's to light the area better. There was a passage descending from the break. Cifonetto moved towards it with a start.

"What the hell do you say to this, Von der Stadt?" he asked, grinning. He stuck head and flashlight into the crude tunnel, but re-emerged quickly.

"Not much there," he said. "The passage is caved in after a few feet. But still, it confirms what I've been saying."

Von der Stadt looked vaguely uneasy. His free hand drifted to the holstered pistol at his side. "I don't know," he said.

"No, you don't," said Cifonetto, triumphantly. "Neither does Nagel. Men have lived down here. They may still live here. We've got to organize a more efficient search of the whole underground system."

He paused, his mind flickering back to Von der Stadt's argument of a few seconds earlier. "As for your bugs and mushrooms, men can learn to live on a lot of things. Men adapt. If men survived the war—and this says they did—then they survived the aftermath. I'll wager."

"Maybe," Von der Stadt said. "I can't see what you are so hot on discovering survivors for anyway, though. I mean, the expedition is important and all that."

We've got to re-establish spaceflight, and this is a good test for our new hardware. And I guess you scientists can pick up some good stuff for the museums. But humans? What did Earth ever get us besides the Great Famine?"

Cifonetto smiled tolerantly. "It's because of the Great Famine that we want to find humans," he said. He paused. "We've got enough to cope even Nagel now. Let's head back."

He started walking back in the direction they had come, and resumed talking. "The Great Famine was an unavoidable result of the war on Earth," he said. "When supplies stopped coming, there was absolutely no way to keep all the people in the lunar colony alive. Ninety per cent starved."

"Luna could be made self-sufficient, but only with a very small population. That's what happened. The population adjusted itself. But we recycled our air and our water, grew foods in hydroponic tanks. We struggled, but we survived. And began to rebuild."

"But we lost a lot. Too many people died. Our genetic pool was terribly small, and not too diverse. The colony had never had a lot of racial diversity to begin with."

"That hasn't helped. Population actually declined for a long time after we had the physical resources to support more people. The idea of in-breeding didn't go over. Now population's going up again, but slowly. We're stagnant. Von der Stadt, it's taken us nearly five centuries to get space travel going again, for example. And we still haven't duplicated many of the things they had back on Earth before the disaster."

Von der Stadt frowned. "Stagnant's a strong word," he said. "I think we've done pretty good."

Cifonetto dismissed the comment with a wave of his flashlight. "Pretty good," he said. "Not good enough. We're not going anywhere. There's so damn few changes to life in the way of new ideas. We need fresh viewpoints, fresh genetic stock. We need the stimulation of contact with a foreign culture."

"Survivors would give us that. After all Earth's been through, they'd have to have changed in some ways. And they'd be proof that human life can still flourish on Earth. That's crucial if we're going to establish a colony here."

The last point was tacked on almost as an afterthought, but caught Von der Stadt's approval. He nodded gravely.

They had reached the station again. Cifonetto headed straight for the platform. "C'mon," he said, "let's get back to base. I can't wait to see Nagel's face."

drop when I tell him what we've found."

They were men.

Grael was almost sure of it. The texture of their minds was curious, but man-like. Grael was a strong mind-mangler. He knew the coarse, dim feel of an animal's mind, the obscure shadows that were the thoughts of the worm-things. And he knew the minds of men.

They were men.

Yet there was a strangeness. Mind-mangling was true communication only with a mind-brother. But always it was a sharing with other men. A dark and murky sharing, full of clouds and flavors and smells and emotions. But a sharing.

Here there was no sharing. Here it was like mind-mangling with a lower animal. Touch, feel, stroke, sever—all that a strong mind-mangler could do with an animal. But never would he feel a response. Men and mind-brothers re-

sponded, and learned. But still it was like mind-mangling with an animal. He could not make himself felt. He could not get an answer.

Still they moved away, and their thoughts dimmed, and the mind-mangling became harder. Grael advanced. He hesitated when he got to the place where the tunnel curved. But he knew he must go on. He was a scout.

He lowered himself to the floor, squatted, and moved around the curve on hands and knees.

Beyond the curve, he started and gasped. He was in a great hall, an immense cavern with a vaulting roof and giant pillars that held up the sky. And the hall was bright with light, a strange, fiery light that danced over everything.

It was a place of legend. A hall of the Old Ones. It had to be. Never had Grael seen a chamber so vast. And he of all the People had wandered furthest and climbed highest.

Grael thought:

That he knew. He was a scout and a mind-mangler. He did not make mistakes. But what he must do he did not know.

They sought the People. That might be good. When first that concept had touched him, Grael had quivered with joy. These fire-men were like the Old Ones of legend. If they sought the People, he would lead them. There would be rewards, and glory, and the tale-tellers would sing his name for generations.

More, it was his duty. Things went not well with the People in recent generations. The time of good had ended with the coming of the worm-things, who had driven the People from tunnel after tunnel. Even now, below his feet, the fight went on still in the Bad Levels and the tunnels of the People.

And Grael knew the People were losing.

It was slow. But certain. The worm-things were new to the People. More than animal, but less, less than men. They needed not the tunnels. They stalked through the earth itself, and nowhere were men safe.

The People fought back. Mind-mangers could sense the worm-things, and spears could slay them, and the great burning rats could up them to shreds. But always the worm-things fled back into the earth itself. And there were many worm-things, and few People.

But these new men, these fire-men, they could change the war. Legends said the Old Ones had fought with fire and stronger weapons, and these men lived in fire. They could and the People. They could give mighty weapons to drive the worm-things back into the darkness from which they came.

But

But these men were not quite men. Their minds were crippled, and much, much of their thought was alien to Grael. Only glimpses of it could he catch. He could not know them as he could know another of the People when they mingled minds.

He could lead them to the People. He knew the way. Back and down, a turn here, a twist there. Through the Middle Tunnels and the Bad Levels.

But what if he led them, and they were enemy to the People? What if they turned on the People with their fire? He feared for what they might do.

Without him, they would never find the People. Grael was certain of that. Only he, in long generations, had come this far. And only with stealth and mind-mangling and H'ung alongside

turn to page 50

The tale-tellers sang of men in ancient times who had strange powers and forms. Could it be that these fire creatures were such men?

sponded, animals did not.

These men did not respond. These strange fire-men had minds that were silent and crippled.

In the darkness of the tunnel, Grael straightened from his crouch. The fire had faded suddenly from the wall. The men were going away, down the tunnel away from him. The fire went with them.

He edged forward slowly, H'ung at his side, spear at hand. Distance made mind-mangling difficult. He must keep them in range. He must find out more. He was a scout. He had a duty.

His mind crept out again, to taste the flavor of the other minds. He had to be sure.

Their thoughts moved around him, swirling chaos shot through with streaks of brightness and emotions and dancing, half-seen concepts. Grael understood little. But here he recognized something. And there something else came to him.

He listened and tasted fully of their

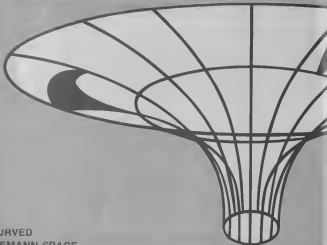
The men were not at sight, but their fire danced around the mouth of the tunnel at the other end of the hall. It was intense, but not unbearable. The men had gone around another curve. Grael realized that he looked only at the dim reflection of their fire. So long as he did not see it direct, he was safe.

He moved out into the hall, the scout in him crying to climb the stone wall and explore the upper chamber from which the mighty pillars reared. But no. The fire-men were more important. The hall he could return to.

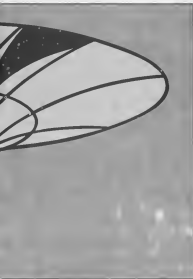
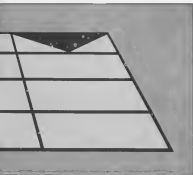
H'ung rubbed up against his leg. He reached down and stroked the rat's soft fur meaningfully. His mind-brother could sense the turmoil of his thoughts.

Men, yes, he was sure of that. And more he knew. Their thoughts were not those of the People, but they were man-thoughts, and some he could understand. One of them burned, burned to find other men. They seek the People,

CLASSICAL "FLAT"
SPACE



CURVED
RIEMANN SPACE



EVEN RELATIVITY IS RELATIVE

article/Igor Bohossian

The idea of relativity is really fairly simple. There is no such thing as an outside observer. There is no such thing as a fixed point. If you're measuring the speed of an object, that speed is relative to you, the observer, not to some fixed point in space. The very idea of a fixed point in space is outlawed by the theory of relativity. That is what relativity is to the layman. Unfortunately, this is not exactly the case. Also, since this opening paragraph seems to be the place to say "in ain't so," let's lay to rest once and for all the popular conception that the brain of Albert Einstein, alone and with an insight no other man was capable of, produced the theory of relativity. This is no more true than it would be true to say that Neil Armstrong built his own spaceship and went to the moon on his own. Armstrong needed a tin-

In curved space a geodesic, the shortest distance between two points, is always a curved line, or even a multicurve.



Albert Einstein, the father of relativity and the man who blended the esoteric math of Gauss and Riemann with the real world, determined that the mass of an object was what caused Riemann's spacial curvature, and that mass, time, energy and space were all the same thing in different forms

random team, as well as his fellow astronomers, to get to the moon, and Einstein needed the work of generations of mathematicians and physicists, especially his immediate predecessors, Carl Gauss and Bernhard Riemann, to produce the final formulation which he called The Theory of Relativity

Relativity started with Carl Friedrich Gauss, one of those storybook German geniuses of the 19th century who forged more inventions than most men ever dreamed of making

By the time Gauss was in his thirties he was a world famous mathematician, but even with his fame there was at least one idea he had, outlined in his notebooks, which he felt was altogether too

Carl Friedrich Gauss had the idea of curved space, but it was too outlandish even for him.

unorthodox for publishing. In those notebooks, published after his death, was the question why space should be laid out in Euclidian manner, in straight lines? Why, he wondered, could space not be curved? A line, a measurement of simple length, can be curved. A surface, a two-dimensional sheet, can be curved. Why couldn't three dimensional space be curved? Of course, it was possible to show, with pencil and paper, a curvature in a line or a plane. But one cannot show curvature in a three dimensional object—it's strictly a mathematical abstraction, at least to human senses

Gauss had the start of an idea, but his fame actually seemed to get in his way. In 1807 he was appointed to the directorship of the observatory of the University of Göttingen, and, as the acknowledged head of the mathematical community of Europe for the next 50 years, he seemed to become very conservative in what he would, or would not, publish. His notebooks make it clear that it was a constant internal to him throughout his life. But, for some reason, he feared to publish his speculations

Bernhard Riemann studied under Gauss at Göttingen, and, in place of the doctoral thesis of today, in those days the first lecture, given to a committee of professors rather than a class of

Euclid made sense, but only if you couldn't make any close measurements of the real world.

**Gauss and Riemann showed
that Euclid was right, but
only partly so, and that
there was a larger truth**

students, determined whether or not a man received his doctorate. The standard practice was for the aspirant to submit a list of three subjects he was prepared to lecture on, and the committee would pick one of the three.

Riemann submitted his three choices, and Gauss, as head of the committee, picked the most daring of the three, a lecture on the hypotheses which lay at the foundation of geometry at that time meaning classical Euclidean geometry. Riemann delivered his lecture, without once using a number or formula to illustrate a point, and history indicates that of the whole committee, only Gauss understood what Riemann was saying. That was enough though. With the support of Gauss, Riemann went on to develop his multidimensional geometry, and eventually he became head of the Observatory of Göttingen, taking his teacher's place.

While Riemann's multidimensional geometry may be difficult to visualize, it can be loosely described in English, something not-at-all-common in the world of high mathematics. To start with, you must accept the idea of a possible fourth dimension. Look at it this way: A point is non-dimensional. A line is one

**Albert Einstein has the
right combination of
talents to weld theory
and reality into a whole.**

dimensional, having only length. A plane is two dimensional, having length and width. Our "everyday" world is three dimensional, with objects having length, width and height. Now let's add a fourth dimension. How about time? An object has length, width, height, and it exists for a given amount of time. Time is a fourth dimension. It is not, as some stories would have it, the fourth dimension. Time is just another dimension and you can assign it whatever number you like.

It was here that Riemann started getting away from classical geometry. First he expressed the idea that space is meaningless. That space only is in reference to the things it contains. Next he took the generalized concepts of curves and surfaces and applied them to spaces. He took Gauss' early ideas

and finished their development, changing forever man's way of looking at his universe.

Gauss had shown that the curvature of a surface could be defined in terms measurements from within the curved surface, rather than just from outside as was necessary in Euclidean geometry. Riemann took this a step further and applied Gauss' ideas regarding surface curvature to space curvature, and in doing so he formulated a whole new set of mathematical descriptions of space, a space which had not before even been conceived of—even by Gauss.

To develop these mathematical descriptions of curved space he first had to develop a coordinate system for measurement. Riemann's multidimensional space could be measured, or, more properly, defined, in terms of reference curves, and the *quest* to use set of reference curves for Riemann's geometry is the geodesic measurement.

**Einstein's work applied to
objects moving near the speed
of light, as massive as a
galaxy or as light as a
subatomic particle**

A geodesic is a mathematician's way of saying the shortest distance between two points but with a slight difference. On a plane, two-dimensional surface, a geodesic is a straight line connecting the two points. On the surface of a sphere, a geodesic is a great circle curve. In multidimensional space, a geodesic may be just about any kind of curve, passing through any number of dimensions. With geodesic lines to use as references, an infinite number of dimensions were there for Riemann to use in developing mathematical expressions. But they were still just theoretical—mathematical expressions of a philosophical universe.

A young man from Germany named Albert Einstein enrolled in the Polytechnic School in Zurich, Switzerland, and hoped, after his graduation in 1899, to be able to teach physics and mathematics. He could find no openings for teachers, though, and so he went to work for the Swiss Patent Office, spending his evenings studying the abstract mathematical concepts of Carl Gauss and Bernhard Riemann.

While he loved to work with Riemann's abstract multidimensional math, Einstein was interested in other things as well. It was his development of one of M^4 Planck's ideas—regarding quantum—which led to receiving the

**Matter and energy, space and
time, matter and gravity, all
are the same in Einstein's
relativistic view.**

Nobel Prize for his description of how the photoelectric effect worked. And it was his puzzlement over the results of such physical experiments as the Michelson-Morley study which disproved the existence of the ether, which, when combined with Riemann's math, led to the usual formulations of the Theory of Relativity.

The Theory of Relativity is actually two theories, Special Relativity published in 1905 and General Relativity, published in 1916. Both are, and this is what gives the layman's knowledge of relativity, based on the premise that all measurements are relative to the person making the measurements, and that there is no such thing as a *fixed* place in space, a center or reference point at absolute rest from which everything else can be measured.

The first theory, Special Relativity, came out of Einstein's desire to make Newtonian mechanics match the actual universe, which it had seemed to do before science began making really accurate measurements. Special Relativity was worked out to describe the mechanics of things, matter or energy, moving at near the speed of light. Among other things the development of Special Relativity showed that matter and energy were actually forms of the same thing, and it introduced the concept that when a mass (m) is annihilated an amount of energy $E = mc^2$ is released, where c is the speed of light. Einstein

**An event cannot occur in no
space, nor can a space exist
for no time. The space-time
continuum is one.**

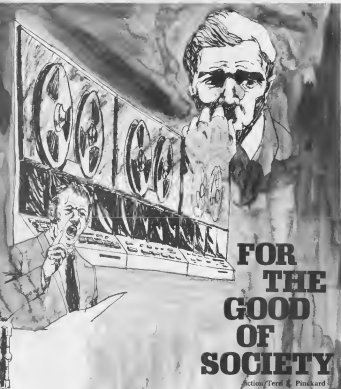
developed this theory to show the relationship between mass and energy, and this equation has affected the lives of all of us, since it is the basic equation describing what makes the atomic and hydrogen bombs go pop, as well as what's happening on the sun.

Einstein's later Theory of General Relativity was actually just an extension of Special Relativity into other areas. In Special Relativity Einstein had been concerned with the stability of classical physics to describe observable conditions

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JUSTICE



FOR THE GOOD OF SOCIETY

Fiction/Terrill Pinckard

Art/Stephen Arnold

When society is no longer able to protect the innocent, then, obviously, the guilty will become that society and the innocent will be cast out.



The newspapers had done an excellent job. Every seat in the massive stone courtroom was taken. The people wore tense faces, eyes staring, mouths open. This was the last day of the trial. This was the real thing.

There were teenage girls, mouths painted, breasts tightly held jutting their softness and youthfulness outwards. Faces hard, their bright glittering eyes danced from one corner of the courtroom to another, taking it all in. Their cold glances relaxed only occasionally by the childlike blowing of huge gum bubbles. Older men, defunct types, sitting behind or next to them ogled them openly, leaning forward in their seats to see as far as possible up the short, sleazy skirts the young girls wore, or down the open vee of their skin-tight sweaters. On the opposite side of the aisle the rows of seats were intermittently sprinkled with others. They looked different. Wary, lined faces, wearing a slight edge of terror looking somewhere, some where. Neatly dressed, sitting quiet, waiting.

Hear ye! Hear ye!" The shouts of a sitting courage to support the weight of the person wearing them sounded through the courtroom. All right. The clerk stood at attention in the center of the

1993. A gavel sounded and resumed their seats, and a murmur ran through the crowd as the defendant looked once around before sitting down.

Prosecuting Attorney Neville crowded to the jury box. He stood searching each of the six faces before him. He began.

"Good morning, honored jury. It is indeed a privilege and an honor for me to stand before you once again, in the name of the Society of the State. It is my obligation to put before you the case of the prosecution. I have done so. I have proved beyond a reasonable shadow of a doubt that this man sitting before you is not fit to live in Society. I have proved to you that we cannot—we must not—allow him to go free. The State assures protection. The State represents Society. There is only one answer. Fred Robinson must be returned to the prison colony—FOR THE REST OF HIS NATURAL LIFE!"

Neville paused a moment, removed a handkerchief from his breast pocket and wiped his now perspiring brow with it. Returning it to his pocket, he stood silently. Then he continued. "Your Honor, Department who are the protectors of your lives and homes, and the Attorney's office. I have gathered together evidence of the indisputable. This evidence is so overwhelming there will be no

The trial would decide not just his future role in life, but whether or not he even had a future.

recourse but for you to return a verdict of Guilty! Guilty of behavior unacceptable to Society!" He turned quickly upon his heel and, going to his seat, sat heavily down.

Benson, the second attorney. He stood where he was, hooking his thumbs into the waistband of his trousers. Turning slightly, he glanced at the defendant sitting beside him.

Rape, robbery, murder—gang fights, motorcycle vandals, dope addicts. They're all around us. Yet we choose to have him in the dock, a man who, up to this arrest, has had only one moving auto violation in 23 years of driving. A man who has raised two sons and a daughter and seen them grow to be full contributing members of Society. He has only his wife left at home, and we are here today to determine whether this man, and his wife, will spend the rest of their lives in prison. Remember, when we condemn a man to prison his wife goes, too—we decided decades ago that it was the only decent thing to do. As my esteemed colleague says, your decision will be on your conscience. All the facts are in. There's nothing left but for the Computer Judge to readout the decision."

Benson returned to a sprawled, sitting position, calmly fanning himself with a copy of *Today's Prison News*. Turning to the defendant, he leaned over and whispered in his ear.

"Don't be afraid now. We'll win, believe me! The Judge is a mighty fair one."

The man nodded, sadly. He looked down at his hands. They were roughened and lined with work, years of work. His wedding ring still shone brightly on his left hand, polished by the rubbing of it with his thumb whenever nervous.

The whine of the big computer known as the Judge started up. The years of Fred Robinson's life began to pour dotted data through its veins. The prosecuting attorney added his input tapes, the second attorney, his. Then the six members of the jury added their individual input tapes. The courtroom was hushed now. Everyone sat staring at the huge machine, its colored lights twinkling and scanning over its surface. They watched, watched for the small card that would be docketed from the right hand slot. What would it be? Guilty of alienation from Society, or Not Guilty? The hall was eloquent.

Suddenly, the defendant turned in his turn to page 79

*Life may be there, or it may
not, but, either way, we're
ready for it.*

LIFE AT A DISTANCE

article/James Sutherland
art/Tim Kirk



Seventy years after first being considered seriously, the possibility of life existing beyond the Earth remains one of the most controversial and tantalizing subjects within science's borders. Like the theory of evolution, the topic of extraterrestrial life has the emotional power to disrupt biochemical conventions, splitting them into angry factions of Believers and the Unconvinced. Lately, though, these occurrences have been fewer and less volatile because of the findings of a new branch of scientific inquiry, exobiology.

Exobiology is something of a paradox. Dealing as it does with finding and analyzing alien life-forms, exobiology is (in Arthur C. Clarke's words), "a science without a subject." Clarke was quick to add that, "despite this, no non-scientist material has fascinated mankind for at least two thousand years."

Fascination, however, doesn't imply acceptance by the scientific community. Exobiology remained a sort of maverick outfit among the sciences until the American astronomer Percival Lowell attempted to give it a firm footing in factual evidence—in this case, Lowell's observations of the planet Mars and its "canals."

Lowell's findings generated an enormous interest in the subject of non-Earthly life, and at the turn of the century exobiology briefly seemed to come into its own. Then Lowell's inspired grab-bag of telescope sightings, deduction and vigorous wishful thinking fell apart when later astronomical research with more powerful instruments than Lowell used revealed no trace of the canals, cities or inhabitants of the red planet. Exobiology slipped back into limbo.

But in the late 1950s a revolution of sorts occurred.

Basic investigation by chemists and biologists into the origins and evolution of terrestrial life-forms began to reveal the complicated methods by which unicellular organisms live and reproduce. Virologists began to understand the connection between living molecules and inanimate ones. And a flood of data from radio telescopes and spacecraft altered the fundamental concept of the Universe man had held for several centuries. The science of exobiology was reborn.

Today, the results of those discoveries have distinctively modified the concept of exobiological research—with a notable exception. It still is a science lacking a subject. No interplanetary explorer has

yet returned with a sample of authentic alien life.

No matter, say the exobiologists. Not possessing actual samples for scrutiny is a drawback, but not a paralyzing handicap, since indirect evidence is piling up from fields as diverse as radio astronomy and organic chemistry to give exobiologists more than enough material to work with for years to come. And so, with much ingenuity and more patience, they are fitting myriad bits of data into a detailed picture of what forms life might take on other planets, in other solar systems spread across the galaxy.

It has been long believed that life on Earth began in the warm, primordial seas, some three and a half billion years ago. The water contained a broth of organic molecules that were, as biologist Rachel Carson believed, "perhaps transition steps from which the complex molecules of protoplasm arose: molecules that somehow acquired the ability to reproduce themselves and begin the endless stream of life."

Only very recently has this persuasive theory been challenged, and then not so much for the reasons, but for the location. The sea may have been the incubator for Earthly life, but the true beginning, the origin of those molecules Rachel Carson called the "transition steps," seems to have taken place in just about the harshest environment a person could imagine: the deeps of space between the stars.

The first evidence that the primary molecules of life were present in vast quantities in interstellar space was found in 1968, by the radio telescope at the Hat Creek Observatory which is run by the University of California. The receiver picked up the frequency that water molecules radiate when struck by radiation. A year later the National Radio Astronomy Observatory's radio telescope at Green Bank in West Virginia detected formaldehyde molecules, and in 1970 it found cyanoacetylene. The same year the NRAO's Kitt Peak (Arizona) radio telescope received signals indicating that a fourth organic molecule, hydrogen cyanide, abounded in nebular formations, the dust clouds where stars begin their existence.

Each of the four molecules is considered necessary as a component of the biological molecular structures, like the amino acids, which are themselves directly antecedent to living cells. That each of these molecules is found in space is remarkable, what is astonishing is the numbers of them that must be congregated

in space to generate signals strong enough to be caught by relatively modern radio receivers on Earth: hundreds of light-years distant.

Astronomers who encountered these signals were also surprised that the signals originated in the vicinity of nebulae, where they would be subject to an unending rain of that by-product of stellar evolution, x-rays and gamma rays of incredible intensities. That complicated molecular strands such as formaldehyde and cyano-acetylene could withstand this "medley of radiation" (to use British astronomer Patrick Moore's apt phrase) poses a puzzle. Instead most astronomers agree now that the molecules are being created continuously—somewhere in the nebula, in the same manner as the precursors of life on Earth were formed when our own sun and its planets coalesced from a similar nebular whirl of gases and dust five billion years ago.

Eventually the organic molecules were strung together into amino acids, complicated organic molecules that can exist for thousands of years unchanged if the conditions are tolerable. Amino acids are the first living molecules if they are linked into chains of DNA and RNA. Add a coating of simple protein to a string of DNA, and there is a virus, a bit of life only a few hundred atoms wide.

Viruses are significant for many reasons, not the least of which is that they fulfill completely the definition of life that exobiologists have arrived at after years of research. What is life? Simply an organization of matter able to contain information, and then utilize that information to reproduce itself.

Current thought among exobiologists places great importance on viral life. Because it is the first direct step down from the interstellar molecules on the path to higher life, the virus (or something similar in structure and function) probably is at the base of the evolutionary ladder of every form of extraterrestrial life. The "bug" that gave you the Asian flu last winter probably has distant relatives engaged in the same activity on a thousand other worlds!

Life-forms not too much higher than the virus, though, are largely responsible for making our existence on Earth a good deal more bearable. At the time when the oceans were empty of life, Earth's atmosphere was a noxious blanket of ammonia and methane. These poisonous gases were gradually reduced over the ages by single-celled organisms in the seas that evolved from the viral



We now know that all the necessary building blocks for life are available in space. We have yet to find, though, any evidence that those blocks have actually combined into a living organism, be it a virus or an intelligent alien.

life-forms, until the air became rich in oxygen and nitrogen. The microbial life that accomplished this feat—one unmatched in our solar system, as far as scientists have been able to determine—were primarily the phototrophs, or plants using sunlight for energy. At the same time, those utilizing the more complex form of energy available in straight chemical reactions (the chemotrophs) began to multiply in the oceans, and started to branch out to obtain energy through the fermentation of carbohydrates and amino acids.

Some of these latter organisms developed the ability to oxidize inorganic compounds, a few, in turn, evolved into weird creatures that seem totally unlike the mainstream of life—virtually alien life-forms. One bacterium oxidizes elemental sulfur into sulfate acid using just a slight proportion of oxygen in the process. Another can oxidize iron totally free from the necessity of oxygen. Obligate anaerobes grow and reproduce only in a non-oxygen environment, for these tiny organisms oxygen is, even momentarily, fatal. Laboratory tests have established that these and several other microbial life-forms could survive on Mars, perhaps even thrive. Native Martian bacteria may know the same tricks of metabolism. Or better.

Mars is of particular interest now, and discussions concerning extraterrestrial life tend to center on it. For exobiologists now see Mars as a proving ground for their theories about the kind of life that might exist on other planets. The feeling currently is thus: if there's life on Mars, then life can safely be considered a fairly common phenomenon throughout the Universe.

This is so because Mars is about the most precious place that amenable life-forms might attempt to grow on. Mars has virtually no atmosphere—equivalent to Earth's at 120,000 feet—which means the surface is bathed in solar radiation. A thin atmosphere means also that little of the sun's weak heat can be retained at night, when the temperature is supposed to plunge several hundred degrees F below freezing. A hot day is one that tops 32 degrees F. Oxygen is scant, being less than one percent, which is greater than the amount of water vapor in the "air," which in turn is largely carbon dioxide. The famous polar caps are likely to be CO₂, ice with but traces of water. In all, a bleakly forbidding world, with scarcely more promise for finding indigenous life than the Moon.

And yet, life could exist on Mars, in one of three possible varieties, according to Dr. P. Molten, an ecobiologist at the Ames Research Center in California. Molten, admittedly a skeptic about Martian life-forms, neatly subdivided the conceivable kinds of life into three mutually exclusive systems: terrestrial life, carbon-based but alien forms of life, and what he calls the "exotic." That is, life which is not based on carbon.

Cerrestrial life as diversified and vulnerable as any, a man or a coconut palm clearly could not survive Martian conditions for more than a few minutes before dying of frostbite or suffocation. However, a surprisingly long list of Earthly organisms can handle the rigors of existing there with little or no modification of their basic structures. Several species of fir and smaller woody arctic bushes regularly endure the Siberian winter when temperatures fall past 100 degrees F below zero from time to time. Still more diminutive forms of lichen mosses and some varieties of algae also seem able to continue functioning at this, and even lower levels. Additionally, a few species of plant produce their own oxygen from sunlight and chlorophyll within their leaves, a process called anaerobic respiration, in laboratory tests when atmospheric pressure was lowered past Mars' own tenuous six or seven millibars. Even more impressive is the ability of some insects, spiders and small reptiles to remain alive in simulated Martian environments, which included almost no oxygen, extreme cold periods and high levels of radiation.

Despite the hardness evinced by terrestrial life, it is far more likely that Martian life-forms will belong to Molten's second category: carbon-based, but still quite alien creatures and plants. For even starting with the same interstellar molecules as a base for life, biologists are of the opinion that the evolutionary process on a planet as different from Earth as Mars would produce totally dissimilar strains of life. It is probable, then, that Martians may have a similar basic chemistry, and perhaps a few similar life-processes, but will otherwise bear little relation to any form of life here.

Along these lines, it is expected that data from Mars' IX orbiter and the upcoming Viking lander spacecraft as to the geological state of Mars will further influence ecobiological theories. The geology of Mars is related directly to the evolutionary progress life may have made. For example, Dr. Carl Sagan, an American astronomer recently noted

that it is something of a tradition of thought that Mars is an ancient world, dried up and dead—a picture of what Earth will be like millions of years hence. But Sagan maintains that this is simply conjecture on the part of astronomers. Mars actually may be a far younger place than Earth, and if that is the case, life there may have only begun evolving. This would make the planet an invaluable laboratory in which to check Darwin's Theory once and for good. On the other hand, Mars may indeed be the venerable place many scientists have always considered it to be, and so would be doubly valuable in studying the strenuousness of life in the long reaches of time.

If Mars is geologically ancient the effects of changing climates down through its history probably has greatly affected whatever life resides there. That factor, combined with the consequences of high solar radiation dosages due to the thin atmosphere may have produced creatures unimaginably strange in biological makeup, but well adapted to the tough present Martian climate.

Heavy radiation, which at first glance might seem detrimental to developing life, might prove somewhat beneficial ultimately. The work of Nobel-prize winner Hermann J. Muller with X-rayed fruit flies demonstrated that normally mutant genes are recessive, keeping out of sight in a particular species and increasing in variety. When the environment changes, and the "normal" members cannot adapt and die off, a few freaks with double-recessive genes are able to survive and go on to reproduce their kind. On Mars, the number of radiation-induced mutant genes might be considerably higher in a species, enabling it to change with the weather. Also, it would provide the mechanism for ensuring successively harder and more flexible generations to cope with the unexpected: disasters like solar flares, for instance.

In the course of a planet's lifetime, the path evolution could take a species on is wildly unpredictable. It has always been so on Earth, on Mars it can only be more so. Rarely does a line of evolving creatures proceed straight from one form to another. Instead, there are innumerable side routes, forks and some deadends as a species evolves. Sometimes the chain loops around entirely.

The remote ancestors of the whales and dolphins, for instance, were ocean-dwellers who gradually reached to the land tens of millions of years ago. For all practical purposes, they had evolved

into terrestrial animals. But some quirk in their genetic history dictated yet another change, and they returned to the sea. This kind of evolutionary behavior is termed "re-evolution," and it is one of the least-understood mechanisms in the entire spectrum of evolutionary processes. It is, though, a remarkable demonstration of the extreme adaptability of life to meet environmental change.

Whether or not Martian life enjoys the same ability is, of course, open to question. It is entirely possible that the number of species of life-forms there has diminished radically from the (supposed) state when the atmosphere was thicker, the temperature range less wide, and the radiation dosage lower. Martian organisms we encounter in the next few decades may be the pitiful remnants of an ecosystem flowering that since has been relentlessly decimated by a climate growing ever more harsh and anything. Yet those surviving life-forms will be a major discovery, unparalleled in history.

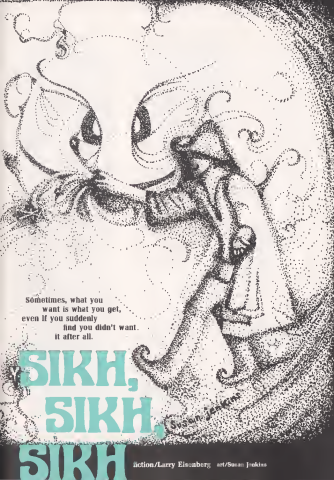
What might they be like?

Supposing that they are, indeed, carbon-based and alien, they might well be presumed to share some characteristics with terrestrial organisms. Some of these characteristics are hinted at by a few specialized plants and animals here, existing in various sections of the globe.

Ecobiologists generally agree that the best hope for Martian life lies in the plant kingdom, since plants seem to thrive where even the most rugged animals have a difficult time staying alive. In particular, the south African plant family, the succulents, might be regarded as an Earth-bound model of a Martian plant. Naturalist Ruth Moore observed that the succulents are often called "stone plants," "because they resemble rocks and are nearly as tough and rugged as stones."

Growing in the deserts and dry hills of Africa, this plant group stores precious rainwater in their fleshy tissues of the leaves and stems. When the long, devastating drought season hits, the succulents can exist on their interior reservoirs for months on end. One variety of African plantlife is the *Welwitschia mirabilis*, reputed to be the oldest plant on Earth, as well as one of the hardest. Little more than a thick, woody trunk buried almost totally underground, about all the *Welwitschia* shows above the surface is a knobby hole and a few heavy leaves that flap in the dry wind like strips of newspaper. Conserving moisture and nutrients deep down in its stem enables this





Sometimes, what you
want is what you get,
even if you suddenly
find you didn't want
it after all.

SIKH, SIKH, SIKH

Action/Larry Eisenberg art/Susan Jenkins

He was well established as the assistant to the publisher, but he wanted more. He wanted not only to be publisher, but to possess the publisher's wife as well, which only goes to show that he really didn't have much sense.



As a young man I was a misanthrope, baffled about by the bulges of the Intergalactic Business World. You might think I was exaggerating if I listed the innumerable insults and humiliations I passively endured at the hands of my employer, Oregano Feldspar.

Mr. Feldspar, a clandestine publisher of pornography marketed on dyed onion skin that glowed in the dark, had been violently deported from seventy percent of the populated planets of the Galaxy

He had the uncanny talent of visiting a new culture and grasping almost intuitively the essence of what they would consider dirty. He was a short, fat, roly poly man-about-town, a devil-may-care rake with a monotone voice that set the ear drums abuzz.

I was general factotum at Feldspar Publications. I was loaded down with every conceivable technical and sales duty, and was rewarded with the title, *Assistant to the Publisher*. I had just been thrown out of Feldspar's office, one day, having entered without knocking just as he removed the sweater of his secretary, when a small, gnome-like creature appeared before me, carrying a bundled manuscript held together with dirty twine. Behind him our aborigine receptionist, whom Feldspar had christened Miss Schultz, plucked at his tattered sleeve, vainly trying to get him back to the waiting room.

"Leave him to me," I said brusquely. Miss Schultz was clearly rattled and behind her rhinestone-studded baroque glasses, resentment smoldered in her three, tiny, close-set eyes. She stammered off, muttering her general disgust with the way I ran the office.

I guided our shabby visitor into the manzany cluttered foyer that passed for my office, noting his swarthy complexion and strangely pale chin and forehead. Since, even during our "summer period," we had but four palid hours of daylight, he was clearly a stranger. He seemed to be aware of my thoughts because he chuckled before speaking in a deep bass.

"My name is Ahn Singh," he said as length, the words quaintly accented. "My home is the planet Earth, where I was once a member of the Sikhs. In those days, I wore the curling beard of the Lion, the proud turban of a hero, and the dagger of Micka at my side. You're probably trying to guess why I was expelled by my people."

"You refused to tell Sikh jokes?" I offered hopefully.

"If I had my dagger, I'd skewer you for that," he snarled.

I hastily put away a carelessly displayed letter-opener. The ex-Sikh attempted to angrily pace up and down in my tiny room and only succeeded in barking his shins on an open desk drawer. I offered him antihemorrhoid ointment but he rejected it with a wave of his hand.

"For fifteen years," he said, fixing my eyes with his somber gaze, "I've tried to sell my writings. My walls are fes-

tioned with rejection slips in every civilised script of the Galaxy. I haven't even cracked the local *Panjab Review*, and they pay only in magazine copies.

He paused and smoked his newly shaven chin.

"I finally realized that the world has little interest in significant material which is beautifully written. So I've gone commercial. I have written down, against the wishes of my people, the full details of the amorous affairs of the god, Dabke. For the first time I reveal to each and every Galactic reader the cunning artifices, devices and snares used in seducing seven thousand concubines of the King of Persia."

"Seven thousand?" I said. "Isn't that a bit of an exaggeration?"

Abri Singh sneered.

"It seems like a lot to a non-Sikh. And yet my account is thoroughly factual. Inside this jacket is a full translation, unexpurgated, ready for immediate publication."

"I hesitate to tell you this," I said shyly. "The market on porno is cluttered at the moment. One of our best writers has just rewritten all of the novels of the Earth woman Jane Austen, into a series of dirty, photo-studded paperbacks."

"Jane Austen? Bah!" cried the Sikh. "What did she know about love philtres and amulets?"

"Love philtres?" I said, my interest suddenly roused. "What do they do?"

The Sikh reached deep into his tattered burlap cloak and brought out a small vial of milky fluid.

"There is enough here for one exploit. Try it with my compliments. If you are satisfied, I expect immediate publication, a contract with rising percentages, unionised rights, Galactic options, and all medical rights."

"It's rather unusual for a writer to give a publisher an advance," I said thoughtfully, sniffing at the contents of the vial. "And the contract, if there is one, will make you liable for returns, lawsuits, publicity expenses, and printing errors. It will also require a small subsidy on your part. But we can talk about this minor point at another time."

I rang for Miss Schultz and she escorted the Sikh out in a dignified manner, staying at least three paces from him, as though he were a medieval leper.

As the two forms needed, the outlines of a long, maturing plan took form in my mind. For many years I had borne the lash of Feldspar's tongue, the jabbing of his massive elbow. He had even

adopted my idea of a psychedelic version of the twentieth century classic, *Spook on Baby Care*, and pretended that it was his own. Now I wanted to hit him in his most vulnerable spot.

To the world Gregorio Feldspar was a leading libertine, and a rose without peer. But it was not too well known that he had a wife whom he guarded with fierce jealousy. From time to time, when he was high on Galactic Weed, he would let drop hints of her fabled beauty. Once he implied that a single look at her face meant courting madness. He admitted that he kept her at home, safe behind triple-barred doors, in order to forestall would-be seducers.

Once, after a bad trip, he seized me by the collar, tried to throttle me, and screamed that I had designs on his wife, Fawn. Before I could free myself, my eyeballs had distended like toy balloons. I swore that I was disinterested in any woman. But he had in a flame in me, a flame that he fanned with his hints, winks and nods, fumes and innuendoes. I dreamed of Fawn, wrote her plagiarized love letters in my mind, and yearned to feel her cool hand on my fevered brow and lips.

I realized that the situation was hopeless. I didn't know Feldspar's home address and he maintained an unlisted Vintecore number under an assumed name. But now, with the Sikh's love philtre, my hopes came to life. Perhaps I could cuckold my nemesis, throw the conquest in his face, seize my finger and quail. I poked up the vial once again, studied its contents, and pondered what strategy should be adopted.

At three o'clock, sector time, Feldspar waddled out of his office, his dishevelled secretary clinging to his arm. His massive body was draped in an ill-fitting set of gaudy faded towels, and his plastic spats were buttoned on alternate buttons only. His neck was alive with hair marks.

"I'm making the rounds of Book Row," he snarled.

I knew what he really meant. I had read the news of Spacebus arrivals. Feldspar was going to tour the Spaceports in the desperate hope of gleaming a new pornographic verse off the washroom walls of newly docked vehicles. He was editing an anthology called *Galactic Graffiti*, with the aid of a sharp sensor and blind conscience. The moment was at hand. It was now or never for me.

When Feldspar had squeezed his enormous frame on to a lumpy force-field

elevator, to the dismay of his secretary and the ten passengers already aboard, I stole into his office and jammed open his drawer with an open paper clip. There, beneath a mimeographed list of aphrodisiacs, was the treasure I sought, his private Vintecore number and home address.

I closed my desk, took the love philtre and hastened to inform Mrs. Schultz that my Beigelwan malady had returned.

"I'm going home and lash myself to the high mast," I said weakly.

She displayed not a trace of pity.

At the local Galactic chain store, I purchased a pair of hip length boots, an electrostatic field raincoat, and a nuclear spray gun with insect destroyer. I then contacted Mrs. Feldspar by Vintecore, informing her that I was a member of the exterminating team which kept her home free of *Panjab Predators*, a hideous roach-like insect.

She kept her video switch off, but her voice was sultry and seemed built upon layer on layer of poison.

"I can't let you in," she said. "My husband would be furious."

"Orders of the Sector Board of Health," I snapped. "You have no choice."

She sighed deeply and agreed reluctantly that I could come.

The woman who responded to my vibrant ring was veiled in the Turkish manner and encased in a cabinet-like device. I brushed past her and pumped my spray gun at the baseboards of every wall. The odor was foul and she hastily withdrew into her bedroom. I followed after her.

"Not in here," she cried, wringing her hands in supplication. "If my husband knew that you had come in here, he would kill you."

"I must," I said. But in accordance with my plan, I did not release the spray.

She seemed to grow faint and I pressed the love philtre into her hand. She drank it without thinking and fell back on her bed, a circular number twenty feet in diameter. The walls were hung with lavish pseudo-tail brocades and imported Surian tapestries with exotic, figured designs. The bed covers were of Xanthian lace, stretching out in a sea of ruffles in every direction. Overhead was a computerized battery of luminous couch phantoms.

The philtre now seemed to take effect, and the bosom of Fawn Feldspar began to heave passionately. She tore her veil free, sobbing, "I love you, madly, devotedly, consummately."

I am myopic. Vanity keeps me from

wearing glasses and allergy from accepting those inevitable contact lenses. But even with blurred vision, Fawn was no prize. Her complexion was lackluster, her facial features appalling, but the dis had been cast.

I tagged at the cabinet that encircled her waist.

"What the hell is this?" I cried.

"It's a random access chastity belt that opens only if the properly coded punched card is inserted," she said. "It was made to order for my husband."

I kicked savagely and the binary-coded door swung shut.

"Sikh Scupper Tyranny!" I cried.

With one hand I held off Fawn. With the other I set up a three-dimensional holographic camera with integrated recorder on an unsteady tripod. Having set the aperture, I proceeded to fill her have her will with me.

I reached home sapped, but filled with joy. After unleashing the camera, I personally developed every foot with loving care. The color was rich and full, the sound unmistakably clear. I took it to the office with me the following morning.

Feldspar staggered in, apparently debilitated by a night of violent debauchery, his eyes pulsating with swollen red veins. He beckoned me wearily into his office and I followed his sagging form.

"I want you to look at my new scheme," he growled. "It's a gaffe calendar and each month represents a different planet."

I examined the sketches and each had less redeeming social value than its predecessor.

"It can't run," I assured him. Then I brought out the film. "I have something hot to show you," I said.

His owl-like eyes glinted.

"Run it," he croaked.

I set up the projector and ran the three-dimensional footage in slow motion with full fidelity sound. There wasn't a peep out of Feldspar during the entire film. When I switched on the lights, my heart speeding and my mouth dry, he was grinning at me.

"I'll buy the print," he said cheerfully. "And I've got a little present in return."

He handed me a sector unit of randomness, indicating that I was correspondent in a divorce suit he was initiating. As the blood drained from my cheeks, he told me how he had duped me.

"It was something that took a long time to carry out," he said gravely. "Irit Singh is an unemployed actor from Planet Gamma and his real name is

Irving Harosavian. I suspect that when Fawn tore off her veil, even your photon-free eyes must have known that I was lying about her fabled beauty. I also apologize for describing her as a spitfire, saucy wench and nest-bait of hell. I spread the bait everywhere but you were the only one to bite. Damn it, there are no more venomous men in this Galaxy."

"They broke the mold when they made you, Oregano," I said.

He nodded.

"And now, I'll tell you what I propose to do," I added.

His jaw dropped at my effrontery.

"Who cares what you do," he belatedly.

"You will," I said. "I know the real you. You're a pseudo man-about-town. The red veins are actually etched on contact lenses. Your dalliance with your secretary and other assorted fornicis is strictly an act. You want to dump Fawn because she really is a wild creature of unbridled passions. You're a secret ascetic, attempting to keep up a business front of dispassion and lust. You're a power!"

He crumbled before me.

"You're right," he stammered. "I've loathed every moment of those seasons nights in the Galactic bigness, sipping space champagne and heaving my torso in mock ecstasy. I'm tired of inspecting every pore of my enormous body for

inopportune social disease. I want out, out, out!"

And he began to beat his enormous fists against his desk as fat tears squirmed out of his eyes.

It's fifteen years since Oregano returned to Earth and entered a lunasery in Tibet. The firm has prospered under my carry hand. Our bread and butter item is a libidinous children's series under the guidance of a child psychiatrist who hates adolescents.

And now the time has come for me to make my own move. For the past few months I have dropped hints about Fawn, my wife. I suggest that she's a wild, sensuous creature, veiled, sultry, indescribably lovely, locked in a room within seven locked rooms, and guarded by a fierce ransuch with a five-foot scanner.

Dutemple, my hollow checked assistant who severely reads John Keats, is becoming restive. I think his big moment is at hand. Last week I put through an urgent triax-Galaxy call to Harosavian on Planet Gamma and induced him to revive his great performance as the literary Sikh.

With the advance of years, my myopia has receded and with each passing day, I am beginning to see the features of Fawn more and more distinctly. Poor Dutemple.



EVEN RELATIVITY IS RELATIVE

from page 49

in the universe where those conditions involved bodies, from subatomic particles to fleeing galaxies, moving at substantial fractions of the speed of light. However, the equations applied only to objects moving at steady speeds along straight lines.

In General Relativity Einstein brought in Riemann's forms of space and redeveloped his concepts to apply them to objects moving with changing speeds along curving lines, through curved space. These, Einstein's Field Equations, covers the entire operating principles of the universe.

While Einstein's insight into the workings of the universe was undeniably fantastic, it would simply not have been possible without the prior development by Riemann of multidimensional geometry. Riemann's curved space, which, when he postulated it, seemed to be only a theoretical description of a mathematical body, totally unconnected to any "real" space, Einstein saw that Riemann's figurings actually described space as it curved, and that the Newtonian and Euclidean forms of looking at the universe were only correct on the grosser level, only approximations of what actually existed all around us.

To describe his model of the universe Einstein found that he needed four dimensions—our normal three of length, width and height, and one for time. Not only had he shown that matter and energy were manifestations of the same thing, but that time and space were inseparable. That you cannot talk about either one without talking about the other. That something which occurs at a certain time has to occur at a certain space and that something occurring at a certain space has to be occurring at a certain time. He called this model his space-time continuum, and within months of his publication of General Relativity, experimental evidence to back it up began to come in, confirming his predictions of how the universe should be working.

Relativity wasn't through giving insights into the ways of the universe though. Showing that matter and energy were different forms of the same thing, and that time and space are inseparable, were but two of the other major "relativity revolutions." The third was the Einsteinian description of what gravity is, and how it works.

For years man had been puzzling over gravitational attraction. It was thought to be something like magnetism, but magnets didn't work on flesh and

wood and glass. And besides, one could shield or counteract magnets, but gravity seemed to be all-pervasive. Then Einstein, with relativity, showed that just as mass and energy are different forms of the same thing, matter and gravity are inseparable.

Using the concept of multidimensional space, Einstein showed that mass distorted that space, curving it, making reality match the curved theoretical space of Riemann. To visualize curved, distorted Riemann space you'll have to give up one dimension. Imagine that space is a rubber sheet. Next imagine a bunch of objects, ball-bearings, apples, or whatever-you, lying on that sheet. If the sheet is suspended off the ground, those objects will dent the sheet downwards (because of gravity). Not quite a picture of Einsteinian gravity, since it depends on gravity, but an illustration, anyway. The bigger one of those objects is, the farther it distorts the sheet. The farther it distorts the sheet, the more

tendency there is for other objects to fall into that distortion. And, the closer they get to the object causing the distortion, the faster they'll fall.

That, once again, in effect, is the way Einstein saw gravitational attraction as working. A mass, be it our planet, our sun, our galaxy, or our universe, distorts the "fabric" of space, forming "gravity wells" around every particle of matter. And, since space is curved, according to Riemann and Einstein, and the curvature would be much greater near a mass, then, we should be able to see the curvature in a beam of light when it passes near a large mass. That was the experimental proof needed to make relativity acceptable, and it was conducted successfully, in 1919. During an eclipse astronomers were able to watch beams of light from distant stars passing behind the disc of the sun, and, sure enough, those beams were ever so slightly bent out of "true" when they passed very close to the sun. Relativity was real. Q



"Well, well, speak of the devil!"

A NICE PLACE TO VISIT

from page 20

did Java-10 commend it? Ah, notice how he fidgets. This wasn't your idea, was it?"

"That has nothing to do—"

"It has everything to do with it. Jeff, you're a puppet, a slave to that ship up there. Do a nice job, perform your mission well, and you'll get a pat on the back, a commendation, maybe even a medal. Is that all your life is worth to you?"

"I've got a responsibility to the Corps, to Earth."

"Screw them! What about your responsibility to good old number one? How about learning to enjoy yourself?"

"Earth needs me."

"Sure, like President Ferguson needs another hole in his ass?" Bael looked around him. "Hey, come on over, fellas, join the party."

Fifteen other men strolled out into the open space where Ryan and Bael were seated. They came from all directions, and their guts were as securely as Bael's had been. They were the rest of the explorers who had come to the city on previous expeditions. Ryan knew most of them, if not personally then at least by reputation. They had been tough, experienced men before coming to the city. Now they appeared soft, relaxed, and well satisfied. They all greeted Bael and smiled warmly at Ryan.

"No doubt," Bael said to Ryan, "you want to whip out your communicator and tell Java-10 the good news that everyone is alive and well and gathered together here in one place."

As a matter of fact, that was exactly what Ryan wanted to do. Despite the friendly expressions on the men's faces, he felt acute discomfort at being surrounded by screen deserters. He wanted more than anything right now to hold that cold metal box in his hands, giving him the warm reassurance that there was somebody up there who was interested in his well-being. But this conversation seemed to be turning into a personal duel between Bael and himself, and he refused to give his adversary the satisfaction of being right. So he said instead, "I can report later."

"Alla boy?" Bael grinned. "You're learning already. Within a couple of days, you'll be as free as any of us."

Ryan had the uneasy feeling he had fallen into the other's trap. "But I don't have a couple of days," he returned spitefully. "If I don't leave here by noon tomorrow, I will be considered lost, the same as you. And if I am, Java-10 will bomb this city to sub-atomic particles."

The other men stopped smiling. All except Bael, whose good humor ap-

peared unshakable. "I don't think," he said quietly, "that the city would allow that to happen."

It was Ryan's turn to be silent for a moment. "You talk as though it were a living being."

"I haven't the faintest idea whether it is or not. But after you've been here a little while, you'll begin to wonder. It certainly knows what's going on in our minds. It acts on our thoughts and molds our dreams. It loves us, Jeff, and it won't let anything hurt us."

A chill went up Ryan's spine. Bael was serious, as only a madman could be. He gulped and said, "Nevertheless, I wouldn't want to be here to test its love when the bombs start falling."

"You're free to leave whenever you want," Bael pointed out. "Nobody's going to stop you."

Ryan realized with surprise that Bael was right. He had been positive he would find some diabolical force lurking somewhere within the city that would try to hold him here against his will. Instead, all he had found thus far was a marvelous technology and sixteen friendly lunatics. He had not succumbed—yet—to the insanity of the others, and he felt no odd compulsions preventing his departure. He was free to go at any time.

"Of course," said Tanbro Sutakami, one of the other explorers whom Ryan knew vaguely. "Java-10 might not be altogether happy with you if you did."

That was the rub. If he left now, he would have nothing significant to report. He had been sent to find out who these men hadn't returned to their ships. So far, except for a few Indonesian generalizations that Bael had mouthed, he still had no clue as to the reason. If he left the city now and went back to the ship, he might as well never have come.

"I've still got my job to do," Ryan insisted stubbornly. "I'm not about to quit in the middle. I've got to find out why." And he halted.

"Why we went crazy?" Bael finished for him. "From our side of the fence, it's why we went sane. The answer is all around you, if you'll just stop to look for it. The other fellows and myself are probably distracting you. Maybe it'll help if you're alone for awhile. Fellas, let's leave Jeff here for a bit. Remember, Jeff, if you want to talk to anybody, just give a holler. Someone'll hear you."

Bael and the others started walking casually off, talking and laughing among themselves. It was as though Ryan had suddenly ceased to exist for them. Within a minute, all of them were gone. The suffocating silence once again re-

turned, leaving Ryan sitting in the middle of a seemingly deserted city.

The explorer reached quickly for his communicator and spewed out a desperate report to the ship above. He was hoping for advice, but the ship just acknowledged the message tersely, told him to remain cautious, and clicked off.

It wasn't until he stood up again that he saw the girl.

He waited for a long moment, unable to say anything.

The girl was not remarkably handsomely. "Hello, Jeff," she said in soft tones. "Remember me?"

Remember her? How could he forget Dorothy, the first girl he'd ever slept with? Dorothy, with her small but womanly bosom, her tinkly laugh, her warm desire to please.

"You don't exist," Ryan stated flatly. "You're not real."

Dorothy cocked her head in that funny way she'd always done whenever he said something she didn't understand. "Aren't I?"

"I'm in no mood for playing question and answer games. First Bael, now you. Whatever you are, you're not Dorothy. She's a hundred percent away, she's married and she's got three kids. You're nothing but a fraud. Go away."

Dorothy just stared at his feet and didn't move. "You don't love me any more."

"Look," Ryan said. "I'll admit you're a clever hoax. It's just that I know you're not real. It's not your fault... you lied."

"Not real?" Dorothy looked up, her eyes wet and teary, her voice wavering. "You can see me and hear me, can't you? If you came a little closer, you'd smell my perfume. If you'd snash out, you'd touch me. If you bit me, you'd taste me. How much more real can I be?" Her plea bordered on hysteria.

Ryan hesitated. She must be a hallucination. There was no doubt about that. The well-mannered officer as he longed to reach for the communicator in his pocket. But the man in him said no. And some third part of his mind kept repeating, "You're a fool." But which part was the fool? He couldn't very well love a product of his imagination that had somehow materialized before him. This Dorothy was cold, unreal, a shadow product of a mystery city.

And suddenly she was in his arms, feeling very real, very alive. Her face turned up, seeking his. Her smallish breasts crushed against him, her thighs pressed tightly to his with small undulations that were faintly sexual. Ryan tried to resist, tried to tell himself that this



Find the brain center of the city, JAVA-10 had told him. Easier said than done. Where was he to look? The geographical center might be the logical spot, but how was he to find that? He had no idea of where he was at present, and even if he did, he had no directions.

wasn't happening. He had his choice of lies, but the Dorothy in his arms was somehow the most convincing. Her left hand caressed the hair on the right side of his head. Her right hand fumbled greedily at the buttons of his tunic collar. Her mouth pressed to his, opened, and out danced her small, firm tongue to run itself along the tips of his teeth.

There no longer was, could be, any doubt. To hell with logic! This was real. This was no delirium of his mind, but the genuine flesh-and-blood article. He swam in a sea of sensation. The two of them fell to the ground, which somehow seemed to become rubbery and resilient. But his mind did not have the chance to dwell on this matter, for his body refused to let it. Reason withered before passion, as it had always done for centuries.

No regretted was he, in fact, that he did not even notice the insistent buzzing of his communicator.

Later, Dorothy stood up again. "I've got to go," she said.
"Must you?"
She nodded. "But I'll be back any time you need me. Just call for me. I'll know." And she was gone.

Ryan lay there on his back, staring up at the sky. It was much darker than it had been before, and didn't hurt his eyes so much. It must be late afternoon. In a few minutes, he would get up and continue his inspection, but right now he was too satiated to move. Even blinking his eye seemed a gargantuan effort.

"Having fun?" asked a familiar voice. Ryan turned his head sharply to see Bael standing a few feet away, grinning at him. A flash of guilt, shame, and indignant anger brought him scrambling to his feet. "What are you doing spying on me?"

"I'm not," Bael said, and his grin widened. "I was just in the neighborhood and thought I'd drop in. And besides, I could ask you the same question, except that I know the answer."

Ryan wasn't sure which infuriated him more—Bael's glibness or his own inadequacy in coping with this deserter. Before he could think of anything to say, Bael continued, "I suppose it was sex."

Ryan's expression betrayed him. "I thought it would be," Bael nodded wisely. "That seems to be what most of us loneome, he-man explorer types need the most. It's the one thing the ship's computer can't give us. The city knows, Jeff. No matter how hard you try to hide something in your mind, the

city knows."

"You do believe it's alive." It was not a question.

"I don't know. That depends on what you call alive. If you mean living and breathing alive, I doubt it. If you mean conscious and aware of what's going on, yes, definitely."

"But how?"

"Must you keep asking these infernal questions?" Just for a moment, Bael's outer mask cracked and allowed Ryan the briefest glimpse of insecurity beneath the surface. Then the smoothness returned, and Bael was his casual, nonchalant self again. "Just accept this for what it is, Jeff. This city can give you your dreams. It wants to help you. I don't know how it does it, I don't care. Its builders made it this way, that's enough for me."

"And where are they now? The builders. What's happened to them?"

He was trying to see whether he could break Bael's composure again, but this time he failed. "I don't know. They probably went on to bigger and better things. In a way it's a shame, because I'd really like to thank them."

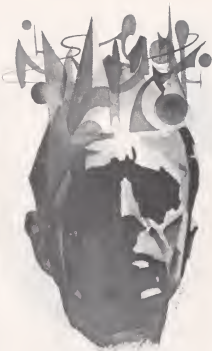
"Thank them for what?" Ryan asked cynically. "For turning you into a vegetable? You just sit around and let the city do everything for you, right? Forget about being a man and start becoming a moocher."

"Are you any more of a man, Jeff?" Bael replied, and whatever smile he was under was coming closer to the surface. "Just who is the puppet around here? Who is it that jumps whenever Java-10 pulls the string? Who can't bear to be away from his comfort for more than a couple of seconds? Which of us is in this city because he's under orders, and which of us walks around as he chooses?"

"You used to be a good officer, Bael," Ryan said quietly. For a moment, at least, their roles were reversed—Bael was on edge, Ryan was the disconcerting one. "Sure, I used to be," Bael spun out. "I took orders and risked my life for dear old Earth. And what did it get me? A handful of medals, a small bonus in my pay envelope every Christmas, a rapidly accumulating pension fund. It all becomes meaningless after a while, Jeff. But not here. The city wants me, needs me. It was built to serve people, to give them what they require. It only wants to help. Is that so terrible?"

"Yes, it is—if it can do what it's done to you."

Bael was struggling to recover his self-control. "Don't fight it, Jeff. This is



He knew the city was wrong, alien, ultimately dangerous. But he didn't know why, nor did he understand that, inside that ultimate danger, a man sufficient unto himself might find the ultimate freedom.

just a friendly warning. The city can protect itself against you, easily enough. It can give you your dreams, sure, but nightmares are dreams, too. Don't think you can fight all your nightmares at once." Rael turned and walked off.

Ryan stood and watched him go. Even after the disaster had disappeared behind one of the buildings, Ryan stood, immobile. Was Rael just threatening, or could the city dredge up nightmares as well as dreams? He was inclined to believe the latter. Again, he thought of how very real Dorothy had been, and he shivered. He had not had any nightmares for a long time, but even so.

He took the commacator out of his pocket and put in another call to Java-10. "Why did you not answer the last call?" was the ship's immediate response.

Vaguely, Ryan recalled the buzzing that had come from the unit during his interlude with Dorothy. "I... I'm sorry," he stammered. Then, like a guilty child facing a stern and knowing parent, he found himself blurting out details on everything that had happened since he last spoke to the ship.

Java-10 listened dispassionately to all his revelations. "You were derelict in your duties during that dalliance," it admonished when he was through.

"I know. I won't let it happen again."

"Very well. But that does not excuse me happening the first time." Then the machine switched to another subject entirely. "A coherent picture of the workings of this city is beginning to emerge. There would seem to be some automatic power or powers operating behind the scenes and cognizant of what is occurring. It seems reasonable to assume that this controlling power possesses some kind of telepathic abilities, enabling it to discover your desires and to project them into your mind."

"There must be something more, besides. That chair I sat in was real. It supported my weight. The girl was also real. Those were definitely not dreams."

Java-10 hesitated. Then, "It might also be appropriate to postulate a system of matter-energy transformation, so that the power operating the city may be able to create matter in whatever form it desires. All these tentative conclusions presuppose an incredible amount of technical sophistication on the part of the builders of the city. It now seems imperative that we discover the city's secret."

"There must be a central area of control, someplace where the higher brain

functions of the city reside. You must seek out this area and incapacitate it without destroying it, so that it may be safely studied."

"But how can I do that?" Ryan protested.

"There is insufficient data at this time to answer such a question," Java-10 answered. "You must first find out more about this system."

"It might be dangerous," Ryan repeated Rael's threat about the nightmares. "Couldn't you send a few more men down here to help me?"

The answer was immediate, and cruel in its bluntness. "No. If one man cannot do this, then the odds are against any group being able to. If the city overcomes you, it will overcome anyone else we could send down. We can risk no other lives. If you fail, the city must be destroyed, no matter how valuable. And, without even wishing him good luck, Java-10 clicked off.

It was now late in the afternoon. The red star that served as sun for this world was setting, becoming a bloodied ball of blood as it neared the horizon. Its light changed the coloration of the entire city and the buildings reflected the macabre hues with a sense of eerie delight coupled with foreboding. The over-pentecent breeze now had a bit of a chill to it, and Ryan, standing in the open, shivered involuntarily.

He hadn't eaten anything since breakfast, and he was getting quite hungry after the day's unusual activity. He reached for a ration can from his survival pouch.

and noticed, off to one side, a large table apparently set for a rich man's sumptuous banquet. The second and pleasant aroma of baked ham, fried chicken, broiled lobster, and barbecued steak assailed his nostrils. Beyond these entrees he could see piles of whipped potatoes yellow with butter, and peas, and

"No!" he said aloud. "No, you're not going to do this to me again! You got me once, but I'm not going to be fooled any more." He started walking away from the table.

The table, on rollers, followed him. "Not this time," he reiterated. He took out an unopened ration can and waved it in the air. "I've got my own food, this time. It may not be as appetizing as yours, but at least it doesn't have any strings attached."

Ryan pulled the tab to open the can. Crawling around inside, on top of the meat, were several large, ugly black insects. Instinctively, he flung the can from

him. The table laden with food moved closer.

"All right," Ryan said stubbornly, "so I'll go hungry for a few more hours. I'm not going to give in to you that easily. Let Rael and the others be your slaves, but count me out." That speech made him feel very proud of his own integrity. Unfortunately, it didn't do anything to ease the growling in his stomach.

Find the brain center of the city, Java-10 had told him. Easier said than done. Where was he to look? The geographical center might be the logical spot, but how was he to find that? He had no idea of where he was at present, and even if he did, he had no directions. There couldn't be any landmarks in a city that constantly changed, where buildings altered their shape as well as their color from minute to minute.

Deciding, after a moment, that any direction was as good as another, Ryan started walking. The banquet table followed him like an eager young puppy. He ignored it, and concentrated his gaze straight ahead.

As dusk became darkness, the lights of the city came on. Not the white sterile, regular lights of an Earthly metropolis, but a phantasmagoria of brightness and color, as though the city had become one large fireworks display. Lights of all hues blinked and shone in mixtures of regular and random patterns. Hypnotic swirlings and combinations streaked up the side of one building and down another in a never-ending array. There was no center for the darkness to hide in, and so it fled, leaving the city as bright as in the daytime.

Ryan ignored the lights and walked on.

Eventually, the table behind him gave up and disappeared. One of the earlier explorers emerged from a building with a bottle in his hand. As he saw Ryan, he waved good naturedly and invited him to join in.

Ryan walked past him.

"Jeffrey?"

He couldn't help but turn at that cry. There, in the doorway to one of the buildings, stood his mother, who'd been dead for the past four years. She had her hair long, as had been the fashion when Ryan was three years old, but her face was the one of her old age. She held out her hand to him. "Come to me, son," she pleaded quietly.

She's not real. Mom is dead. This is a fake Constructer Mission. Fraud.

He turned slowly to walk on.

"Jeffrey? Jeffrey, my son, don't you

even know your own mother?"

Ryan stopped and bit on his lower lip, but he would not turn to face her again. He dared not.

"Jeffrey, look at me. Please."

"No. You're a phony, as phony as everything else in this goddam place. Go away and leave me alone!"

She ran to him as fast she could, favoring her left leg as she always had because of the arthritis. Throwing herself at his feet, she clutched at his sleeve. "I'm your mother, Jeffrey," she wept. "Say you know me. Please. Your own mother." Her wet eyes looked up at his face, and he quickly averted his gaze.

"Let GO!" he shouted. He pushed her away from him. She fell backwards, and her head smashed against the hard ground. There was a cracking sound, and blood started flowing from where her head had hit. She was very still, her eyes staring up at him like a dead fish. He retched, but his stomach was empty and nothing came up but the sour taste of acid.

When the digestive spasms had cleared, he straightened up and continued walking, despite the fact that he could feel her dead, staring eyes fixed on the back of his head. If he were to turn around, he knew, she would be looking at him. That knowledge made it hard not to turn around.

Ryan kept on walking.

They were waiting for him as he rounded a corner. Bael and seven of the other scouts, standing at a single line blocking his path. "If you're not going to play by the rules, you'll have to quit the game, Jeff," Bael said evenly.

"Are you going to let me through?"

The other shook his head. "No. We can't let you go any farther."

"So what am I supposed to do now?"

"One of two things: either go back, or join us."

"And what about my mission here?"

"Quit playing an soldier, Jeff. You're capable of better things."

"I think I want to see what's behind you."

"There are eight of us here, Jeff, and only one of you."

"Yes, but I've got a gun."

"It won't work," Bael said evenly. "Not on us. The city wouldn't let it."

And Ryan knew he was right. Whatever force was in control here wouldn't allow him to destroy anything important. But he must be getting close to something, or this concerted effort would not have been made to stop him.

"Well," he started to say slowly. Then,

with a rush, he moved toward the line of men. The nearest man stepped in to block his path. Ryan gave him a quick kick in the groin, and the man doubled over, leaving the way clear to run past him. Ryan ran, and kept running along the line between the buildings.

"After him!" Bael cried—needlessly, for the other men had already begun their pursuit. At first, their knowledge of the city's layout kept them almost even with him, but desperation lent speed to Ryan's feet. He gave up thinking for the moment, letting sheer instinct guide him around sharp corners that would have beggared his mind otherwise. He found himself racing directly at a black wall, only to have an opening appear the instant before he hit it. He sped through buildings, up stairways, across delicate, arching bridges hundreds of feet in the air, then down and out in, out, around, about, his movements as random and as rapid as he could make them. The pursuers dropped farther behind, until eventually he could no longer see them. Then, even their footprints dropped out of sight. Ryan stopped.

The silence descended again, the silence that had first welcomed him to this city. The only noise was his own labored gasping for air. He sank to his knees, his quivering legs no longer able to support him. Then he laid out his side, as huge lurches of air burned their way into his chest.

His hand went again to the back pocket, touching the communicator. The cold metal of the box again had its soothing effect on his battered psyche. There was an Earth. There was a ship orbiting high above the city, ready to help him. He was not alone in this ordeal, merely by himself.

"You haven't liked me yet, Bael," he panted softly.

"I haven't tried to," Bael's voice came to him. Ryan looked up, startled. Over his head was suspended a large tri-dee screen, filled with Bael's image. "There's no need to run, Jeff, the city can keep me posted of your whereabouts every minute. I can find you anytime I please. But if you want to be on your own, it's your decision. We tried to save you, whatever happens now it's on your own head. Good-bye." The screen went blank.

Ryan looked down at his hand, to discover that his knuckles were white from squeezing the coin unit. He loosened his grip, and at once his hand began shaking uncontrollably. He started a silent string of curses, like a litany, against everyone and everything connected with

this mission, from Java-16 through Richard Bael and ending with what appeared to be his main antagonist, the city itself.

The shadow gave him a second's warning before the bird attacked.

It was an eagle, perhaps, or a falcon—Ryan never did get a good look at it. A brown blur swooped down at him from above; talons extended. The sharp, pointed claws were aimed directly at his face, the curving beak seemed to leer maliciously. The beady eyes were fixed unblinkingly on his features, waiting to take in any reaction this prey might make.

Instinct brought Ryan's right arm up to protect his eyes. An instant later, the talons were making long gashes in the flesh, and the beak was trying to tear at the thinner skin at his wrist. The very momentum of the bird's impact knocked Ryan flat on his back from his previous propped-up position. The flapping motion of the bird's powerful wings caught him on the side of the head as the bird started upward to begin another bombing pass.

He had only a few seconds to recover from that attack, but at that time, his acute training and naturally quick reflexes came to the fore. He rolled over onto his stomach, palms down to the ground. Pushing up, he brought his legs as under him and sprang to his feet. He whirled in the direction of his antagonist, his knees apart and slightly bent, his muscles relaxed and ready.

As the bird came in for the next pass he grabbed one of its talons with his right hand and pulled. The sharp claws bit into the flesh of his palm as the creature was caught off balance. Its wings flapped wildly as it sought to right itself. Ryan caught one of the wings. With a quick, downward motion, he ripped it clear off the bird's body.

The bird, it turned out, was made of paper-mache, and fluttered harmlessly to the ground.

Ryan stared at it incredulously. Large quantities of adrenaline were coursing through his bloodstream, and he felt a little queasy. "Was nothing real in this goddam place? Wasn't there anything he could trust us? In a fit of rage, he smashed the paper-mache figure into any pieces with his foot."

While he was so engaged, the lights went out. He stopped the snarling and stood still in the darkness that had descended upon him. Total darkness, like the inside of a black leather glove. Does the city think I'm scared of the dark? Ryan wondered. He continued to stand

motionless, unstimulated

Small noises came to his ears, scratching, like dry claws on a hard metal surface. It was impossible to tell either their direction or distance. Small chitterings, then a sudden porcine snort close beside him. Involuntarily, Ryan gave a little start.

A small, furry creature brushed by the side of his leg. A sudden breeze carried to his nostrils the strong stench of rotting meat. He could feel hot breathing on the back of his neck. The air tasted of vinegar.

Ryan refused to react, refused to be frightened. Eventually, all these sensations ceased, leaving behind just the dull sensation of absolute darkness once more.

Then a face began to slowly materialize in the air in front of him—or rather, the outlines of a face. Vague lines of turquoise phosphorescence, very dim, just barely perceptible, formed the contours. Ryan had to strain his eyes to see it. For seemingly ages, the face just stared at Ryan, and he back at it. Finally the face spoke. "You are alone," it said. Its voice was the voice of Java-10.

Ryan's hand instantly went to his pocket for the communicator. It wasn't there. Then he remembered—he'd been holding it in his hand when the bird attacked. He must have dropped it in his reflexive action to defend himself. Sudden panic hit him, and he dropped to all fours. The face watched on dispassionately as Ryan began a desperate search with outstretched hands, trying to relocate his link to the ship above.

His hands groped madly in the darkness. Once, they hit upon some cold, slimy, repugnant object and recoiled violently. The search continued.

Ryan looked up for a moment. There were now two faces watching him. "You are alone," they stated, both in the voice of Java-10.

"NO!" Ryan shrieked hysterically. "No, I'm not alone!" His search doubled in intensity. He had to find that communicator, had to reach Java-10, had to assure himself that there was someone up there waiting for him.

Now there were four faces. Now eight. Now sixteen. "Alone," they all said. The word crashed against him like the wild surf, physical in intensity.

"No!" he screamed in answer.

"ALONE," said the faces, now in numbers beyond counting. The sound of their speaking reverberated through his body, shaking his bones and rattling his teeth. "ALONE." And the ground shook with the combined voices uttering that word in chorus.

"No," Ryan sobbed. He clenched his fists and screwed shut his eyes, trying to fight back the tears that were forcing their way out. "No, no, no, no, no." But his sobs were drowned out by the relentless choir that washed over him.

A L O N E

Ryan curled up into a ball on the ground, whimpering as his mind retreated within itself.

And on every side of his mind there was darkness, and what wasn't darkness was shadows, flicking and inconsequential. Nothing to lean on, nothing to hold to. He came to the shade that was Java-10, and fell reverently before it. "Help me," he pleaded, but got no response. He turned to the specter of his partner, Bob Treman, but it was chained to Java-10 and stared sternly right through him. He reached out to touch his twin image, and it dissolved in his metaphorical hand. He continued on. Earth was a fuzzy ball that melted at his touch like cotton candy on his tongue. Friends vanished as though they'd never existed. Relatives were as wags and chairs in ghost. Back, back, back he went, his psyche searching desperately for a receptacle to hold it.

To one side stood the image of Bob, suddenly tall and gaunt, grinning a devil's-head grin and beckoning with a long bony finger. Ryan approached slowly, and didn't notice the snare Bob had set until it was almost too late. The jaws of the trap sprang shut in his face. Ryan fell deeper into the darkness.

Then, in the distance, he saw a light shining. It was dim, feebly glowing, but it was there. His mind raced to it as a moth to a flame. It pulsed, it thrashed. The closer he came to that glowing sphere, the brighter it grew. Already it was bright as daylight, and ever increasing. Then he reached for it, grabbed it in his arms (for all the light it emitted, it was still cool) and perked deep within it. And he saw

Jeffrey Ryan

Forewords

red, green, blue, orange, yellow, ultraviolet, colors without names

EXPLOSION!!!!!!!!!!!!

"Yes, my husband is a science fiction writer
in this call business, or just soccer?"

GEORGE
CAMPBELL

Ryan opened his eyes slowly. He was lying on his back. It was dark, but not the darkness it had been before. Overhead, he could see the stars, twinkling with their usual cold friendliness. He was very hot, his body was drenched in sweat, and his clothes were soaked through. He rolled over onto his side, and nearly fell off the ledge. He was on a balcony that overlooked most of the city. The city itself was dark—and that was uncharacteristic.

A sound to his right. Ryan turned his head sharply. As his eyes became accustomed to the light, he saw his commensurator lying ten feet away from him, buzzing frantically. Ryan ignored it.

Instead, he thought about himself, and the fires flared within him. The city had erred, and erred badly, in its tactics instead of driving him out of his mind, it had driven him *in*, so far in that he was cut off from all sources of strength, except one. The only one that mattered himself. He had learned to be his own beacon, and the external ties had been cut in that instant. Let Jave-10 buzz for him, he no longer needed a parent-figure. Let the city gander all it wished, he controlled his own desires now, not they him. He laughed, and his laughter echoed distantly against some airy tower.

Down was approaching rapidly. He sat up and swung his legs around so that they dangled over the edge of the balcony. And he looked out over the city. Except for the constant buzzing of the comm unit, the stillness was absolute. The city had stopped. No buildings changed shape or position or color. No weird noises, no hallucinations. Nothing but that omnipresent breeze that blew quietly through the spaces between the towers and set the city singing.

No, wait. There was a sound. A low moaning, right at the limit of audibility. A wailing of souls in torment. As he listened, it came closer.

Bael and the others appeared below him. They were the monsters that he heard. Their faces were twisted in grief and exquisite pain, and their posture was stooped, they walked like dead men on their way to Hell.

Bael looked up and saw Ryan. "Give us our city back," he yelled, or tried to. His voice was high and cracked, and barely carried up to Ryan.

"I don't know what you mean," Ryan called back.

"You you do," Bael said, shaking an accusing fist. "You killed it. We want it back."

Ryan was about to profess his innocence when suddenly, he understood

"You were right before, in a way," he called down to Bael, "in telling me to become my own master. Now I have. But you never followed that advice yourself. You didn't throw off the domination of Earth, you only traded it for domination by the city. You're its slave now, dependent on its whims, no matter how independent you think you are. I fought the city last night, and I won. Now the city is my slave. It can't dead, Bael. It's merely waiting for my order."

"Give it back!" Bael croaked hoarsely.

As Ryan looked down upon the pitiful hulk below, a flash of insight struck him. "I know what happened to the beldem," he said to no one in particular. "They were marvelous craftsmen, but they gave themselves up too easily." He stood accusingly at Bael. "Like you, they forgot who was supposed to be master. They reveled in their pleasures and let the city handle their responsibilities. And they died out, probably from sheer apathy. They were too busy enjoying themselves to reproduce."

The men down in the street were sobbing. Ryan continued mercilessly. "This city was built to be a paradise. It can be a paradise. But even paradise has ground rules. You can't accept paradise by relinquishing your hold on humanity, or you'll lose them both. You'll end up just the way you have—in a Hell that neither knows nor cares. The city is my paradise now, Bael, and I'm in charge of it, not vice versa."

"I can't return it to you, because it was never yours to begin with. You belonged to it. Now it belongs to me. I'm setting you free, if you're prepared to accept it. You talked to me about freedom, Bael. Now can you stand to face the real thing?"

He turned away from the men for a moment. Being a master implies responsibility. Ryan was not used to it, but he recognized its necessity. Below him, the men were still pleading desperately for him to give back the city he had stolen. Beside him, the commensurator buzzed insistently, demanding that he return to his former serfdom.

He would do neither. Both the men below and the ship above were forces that must be dealt with, but not along the lines of old, dead relationships. Jave-10 would have to accept the fact that his former servant was now free from its domination. The men would have to learn that the city was now dead to all except those who could control it. Ryan stood up and gazed out over his new domain.

In the east, the sun was rising. O



"This is a stick-up!"

NO BANDS PLAYING

From page 38

danger when it scares the crap out of you and there's an easy way to bag out." I glanced at my watch. "Give me three minutes and I'll tell you about the bravest man I've ever met."

I was a young fellow myself back between War One and War Two and had been in a hospital much like this one Arkwright and Jones and I had visited—pucked up a spot on my lung in the Canal Zone and had been sent there for the cure. Mind you, this was years ago when lung therapy was primitive. No antibiotics, no specific drugs. The first thing they would try was a pneumothorax—cut the nerve that controls the diaphragm to immobilize the lung and let it get well. If that didn't work, they used artificial pneumothorax. If that failed, they did a "backdoor job"—chop out some ribs and fit you with a corset.

All these were just expedients to hold a lung still so it could get well. An artificial pneumothorax they shove a hollow needle between your ribs so that the end is between rib wall and lung wall, then pump the space in between full of air, thus compresses the lung like a squeezed sponge.

But the air would be absorbed after a while and you had to get pumped up again. Every Friday morning those of us on pneumo would gather in the ward surgeon's office for the needle. It wasn't grim—largely are funny people, they are almost always cheerful. This was an officers' ward and we treated it like a club. Instead of queuing up outside the surgeon's office we would swarm in, tell in his chair, sit on his desk, smoke his cigarettes, and swap his while he took care of us. Fois of us that morning and I was the first.

Taking the air needle isn't bad—just a slight prick as it goes in and you can even avoid that if you want to bother with skin anesthesia. It's over in a few minutes, you put your bathrobe back on and go back to bed. I hung around after I was through because the second patient, chap named Saunders, was telling a dirty story that was new to me.

He broke off in the middle of it to clump up on the table when I got off. Our number-one ward surgeon was on leave and his assistant was taking care of us—a young chap not long out of school. We all liked him and felt he had the makings of a great surgeon.

Getting pumped up is not dangerous in any reasonable sense of the word. You can break your neck falling off a step ladder, choke to death on a chicken bone. You can slip on a rainy day, knock

yourself out, and drown in three inches of rain water. And there is just as unlikely a way to hit the jackpot in taking artificial pneumothorax. If the needle goes a little too far, penetrates the lung, and if an air bubble then happens to be forced into a blood vessel and manages to travel all the way back to the heart without being absorbed, it is possible though extremely unlikely to get a sort of vapor lock in the valves of your heart—an embolism, the doctors call it. Given all these improbable events, you can die.

We never heard the end of Saunders' dirty joke. He knocked out on the table.

The young doc did everything possible for him and sent for help while he was doing it. They tried this and that, used all the tricks, but the upshot was that they brought in the meat basket and carted him off to the morgue.

Three of us were still standing there, not saying a word—me, retelling my breakfast and thanking my stars that I was through with it, an ex-field-clerk named Joseph who was next up, and Colonel Hostetter who was last in line. The surgeon turned and looked at us. He was sweating and looked bad—may have been the first patient he had ever lost, he was still a kid. Then he turned to Dr. Armand who had come in from the next ward. I don't know whether he was going to ask the older man to finish it for him or whether he was going to put it off for a day, but it was clear from his face that he did not intend to go ahead right then.

Whatever it was, he didn't get a chance to say it. Joseph stood up, threw off his bathrobe and clambered up on the table. He had just lighted a cigarette, he passed it to a hospital orderly and said, "Hold this for me, Jack, while Doctor"—he named our own surgeon—"pumps me up." With that he peeled up his pajama coat.

You know the old business about sending a student pilot right back up after his first crack up. That was the shape our young doctor was in—he had to get right back to it and prove to himself that it was just bad luck and not because he was a butcher. But he couldn't send himself back in, Joseph had to do it for him. Joseph could have ruined him professionally that moment, by backing out and giving him time to work up a real case of nerves—but instead Joseph forced his hand, made him do it.

Joseph died on the table.

The needle went in and everything seemed all right, then Joseph gave a

little sigh and died. Dr. Armand was on hand that time and took charge, but it did no good. It was like seeing the same horse move twice. The same four men arrived to move the body over to the morgue—probably the same bucket.

Our doctor now looked like a corpse himself. Dr. Armand took over. "You two get back to bed," he said to Colonel Hostetter and me. "Colonel, come over to my ward this afternoon; I'll take care of your treatment."

But Hostetter shook his head. "No, thank you," he said crisply, "my ward surgeon takes care of my needs." He took off his robe. The young fellow didn't move. The Colonel went up to him and shook his arm. "Come, now, Doctor—you'll make us both late for lunch." With that he clambered up on the table and exposed his ribs.

A few moments later he clambered off again, the job done, and our ward surgeon was looking human again, although still covered with sweat.

I stopped to catch my breath. Jones nodded soberly and said, "I see what you mean. To do what Colonel Hostetter did takes a kind of cold courage way beyond the courage needed to fight."

"He doesn't mean anything of the sort," Arkwright objected. "He wasn't talking about Hostetter, he meant the men. The doctor had to steady down and do a job—not once but twice. Hostetter just had to hold still and let him do it."

I felt tired and old. "Just a moment," I said. "You're both wrong. Remember I defined 'bravery' as requiring that a man had to have a choice—and chooses to be brave in spite of his own fear. The ward surgeon had the demons forced on him, so he is not in the running. Colonel Hostetter was an old man and bloodied in battle—and he had Joseph's example to live up to. So he doesn't get first prize."

"But that's silly," Jones protested. "Joseph was brave, sure—but, if it was hard for Joseph to offer himself, it was five times as hard for Hostetter. It would begin to look like a joke—like a man didn't stand a chance of coming off that table alive."

"Yes, yes," I agreed. "I know, that's the way I felt at the time. But you didn't let me finish. I know for certain that it took more bravery to do what Joseph did."

"The autopsy didn't show an air embolism in Joseph, nor anything else Joseph died of, right?" O





She came from
out of time to
bring him a
gift, but she
wanted another
gift in return.

SPRING- TIME A.D.

fiction/Richard Ashby

During the night a wind had come Dup, unreasonably warm for April. For hours it poured down from the high Michave flaps, and when at dawn it slackened off and dipped its heat onto the chill surf in fives of my house a thick peeling fog blinded the cove, boiling up from the sea in vast swirling clouds and tattered that scaled off the world and muted the breakers.

I gave up any thoughts of going back to bed and washed the sleep from my eyes. The mirror told me I needed a haircut and a shave and I said Figure That! and, naked, went out to my deck and jumped the five feet down onto the dunes. Moments later the house was swallowed up and gone in the milky opaqueness. For the fun of it, for the hell of it, I walked backwards through the crusty sand—my unaware but a few square yards ahead and over me with footprints retreating, my unaware that went with me, scented strongly with kelp and brine and pagan hints of incense, sage, wood-smoke.

Lotus-land, I love you
I hoped it was steering back in Chi-cago.

The sand became damp underfoot. I turned and faced a foamy jerk of chilly water that boiled up around my ankles before it slid back out of sight behind the seasons white fog.

No, I guessed I didn't really wish them sweet—those poor bastard dollar-grubbing one-time advertising cohorts of mine. They were the lotus-eaters, but they like their fruit prickly. A morning of fleet made them all bluff and built-on, mainly bluff, with vast pride in themselves for having wrestled on tree chains and gum boots and vomit-smelling topcoats, and in having made it in from their mate-trading, mortgaged communities "Only sixty-eight minutes, by God!"

Driery, wondrous struggle and being
Why live there at all?

A slope of green winter seaweed rushed up onto my feet and I slugged out into the churn of surf, dove into the biting waters, thanked to get warm again. All built-on and bluff, I had to admit to myself. You eat your lotus, jack, I'll eat mine.

But in a minute I was comfortable and I swam out past the breakers. Not dangerously past in this white blindness, but far enough to exult in a physical pride I hadn't felt for, oh—maybe ten-eleven years. Not since I was twenty-two and had finally suffered my way through basic training.

A sixth wave humped up under me. I kicked and caught it and body-surfed in, head down, arms outstretched before

me. I stood in the shallows and wiped salt from my eyes, pushed my hair back—then looked up at the young woman who stood straight, hands at her sides as if at attention. She studied me gravely, up and down. She started into my eyes.

Backwards I splashed, far enough so she was but an indistinct blur in the cottony wall of fog.

It had to happen some day, I supposed, but after six months this had been my private beach. The only road in was an unimproved dirt track that ended behind my house—and mine was the only one on the beach. And my cover—about the length of a football field—had

for the day? Just visiting?"

A pause, then in an oddly constrained voice, "Just visiting."

I could make out her undulated feet, and—vaguely—her legs up to just past her knees. What had she been wearing? I looked into the mist, musing that if I could see this much of her the fog was starting to lift.

Then I stopped, savoring the strangeness of the encounter. It belonged to a weird morning like this. Was she good looking? I had the distinct impression that she was. My usual surprise had driven away the details, but I seemed to recall long straight hair the shade of mahogany, an oval face, and dark eyes.



sheer cliffs at each end, with ragged mountains walling off the island.

But here she was. Maybe she came in by boat, I thought I hunkered down and paddled a little closer.

"Sorry," I said, "The cat time in six months I go skinny-dipping. I get caught."

"Yes," I heard her say "Shall I go?" Her voice was rich. I meant, literally. A trained voice schooled, musical. But almost over-precise, as if English weren't her birth-tongue, as if she'd been extensively tutored. "No," I told her "This doesn't all belong to me. You've got your rights here, too, I suppose."

"Thank you," she said. Then, "My name is Larine."

I walked ashore, yards from her now. "I'm Ben Thornton."

"Yes."

I took a couple of steps toward her voice, peering forward, my hands over my groin. "You're—uh, just down

And the word—what was the word, a kink? A true sort of thing in white, all folds and drapes and caught in the want, ending irregularly above the knees.

The silence went on, so I finally said, "Well, I'll be seeing you."

From the white blankness came a soft crackle. "Yes," she said. "Yes, you will."

The fog was definitely lifting, the strengthening sun overhead burning it thinner. I backed further away. "I just want to say, Ma—" I'd forgotten her name, a bad trick I'm afflicted with. "Just that I'm sorry I embarrassed you like that." I found my footprints of a few minutes ago and began joggling along them up the beach.

"Ben Thornton?" Her voice came softly through the baffles of mist.

I stopped. "Yes."

"I come here alone."

"Uh—sure. Goodbye," I said.

I sprinted for the house and scrambled

up the rickety steps to my deck door just as a new wind came up suddenly this time cool and from the east, and began an errant sweep of the beach, pushing the scraps of fog before it like dust devils. In only a minute or so the girl appeared, standing straight in the shipping wind. Then she clasped her hands behind her and began walking slowly away along the water's edge. I watched until she disappeared around a gigantic pile of weed-encrusted boulders.

In something of a daze I showered and shaved. The woman had to be deranged to face a strange, scraggly, naked man on a deserted stretch of beach and to

He came out of the sea and she was waiting for him, like a dream he had no desire to wake from; a dream he hoped would not become a nightmare.

then inform him she was alone. Either that, or it was the best and most frank offer I'd ever had without working for it.

I tugged on a pair of soft old levis and made a pot of coffee. Briefly I was tempted to face it with brandy, but I decided I was confused enough by the meeting.

Kirtle I put down my coffee and looked up the word. The book said: "a long gown or dress." Oh, so she'd worn a short kirtle. Then a streak me where I'd seen a garment exactly like the one

what was her name? "Lurane!" One just like her, in Italy, seven years ago, etched in ancient but still-brilliant coques on the walls of an excavated ruin at Pompeii. The women depicted were engaged in highly improper antics with toga-wearing men. "Merena," the guide told me. "What you term 'call girls' in your country."

So as a sideline, a business expansion,

so to put it, had the dames been round-heeled it into the future to turn the old dock trucks? The speculation pleased me so I took it out onto the deck to examine it further. Trouble was, I realized, the only English spoken back around 50 A.D. would be about as intelligible today as modern Welsh. And I doubted if even the Welsh can actually understand Welsh.

I walked to my railing and looked over. And there a few yards away was my *hesera*, smug on the sand with her knees drawn up beneath her chin. She had very fine legs, I noted. Slender, yet well-turned. Quality. As if aware of my presence she turned and gazed at me. I did the only thing possible under the circumstances.

"Care for some coffee?" I held up my cup.

She gave me a slow smile and nodded. As the wood, I scanned back to the kitchen for the pot and another cup, for it most definitely was not my intention to ask her in—because she just had to be a wee bit off her moilley. Or she was a thrill-starved wife, and her huge husband, armed, was even now tracking her. A quick coffee on the deck, only!

She spoke and I about dropped the pot.

"I was wondering when you would ask me in, Ben Thornton."

As I turned she smiled at me and reached around to the small of her back. The simple white garment swung free as if it were an apron that had been untied. She shrugged it off and placed it atop my TV set.

Sounded, I poured a cup of coffee, then couldn't help looking at her. Undoubtedly, she was the most beautiful nude I had ever seen. No not quite nude, for she still wore her simple sandals—nothing but a sole and thong that crossed twice over the shin to be about four inches above.

"Sugar?" I heard myself say. "Cream?" I inquired at the normalcy of my voice.

"Neither, please."

I took her coffee from the kitchen and placed it on the rough-hewn redwood table. Then I oriented back behind the partition-bar that serves for my dining.

At her complete ease, the woman packed up her garment again and regarded my TV set. Unselfconsciously she rubbed one shoulder where the thin spaghetti-strap had rested and had left a thin rose streak in the impenetrable whiteness of her flesh. Her small but perfectly shaped breasts bobbed slightly as the motion. Pointing to the set, she turned to me with a quizzical expression.

"What is this?"

"A television set, of course," I said, staring openly at her impossibly narrow waist, her flaring hips, the drapery of her aaseel, the lush taper of her thighs, and at the dusky curling where they joined.

"Oh." With what seemed to be a small gasp she put her garment back atop the set. "I forget things, sometimes. Forgive me."

"Sure." A line from an ancient Greek or Roman play came unbidden to my mind. "Behold this madness, and is sorrow, then, behold this glory of her flesh."

I bound myself with lighting a cigarette.

"Lurane," I said, "you'd better put your clothes back on."

Although I had spoken gently, her expression was one of hurt and confusion. Disappointment, even. "Why, Ben? Am I not to your liking?"

"Good Lord, no woman!" But—

"I'm glad for that." She came nearer, up to the bar between us. She tilted her head and examined me with great gray eyes, an expression I came to know well—that of a wise and intensely curious girl, one who will never be finished learning. "Is it that you are not well? Or perhaps you are a Religious?"

I had to grin. She echoed it quickly, then slid onto one of the high bar stools.

"Lurane," I said. "Lurane what? What's the rest of your name?"

"Lurane of—" She broke off, looked away, and lifted one hand to fuss with her hair. "Lurane-Mai—Lurane-Mallay." Casually, she crossed one weary leg over the other.

Her lying was so obvious it hurt, but I let it go for now. "Lurane Mallay, I'm so healthy I should be arrested. And I'm not, as you put it, a 'Religious.' Fact is, if this were a year ago you'd shucked out of your shift in my Chicago pad, I would have looked the dove and we both would have ended up with carpet burn. But—"

Her grin told me that I had wandered badly astray. "What I'm trying to say is, ah—"

"Why are you dressed, Ben?"

"Look, cut it out, damn it!" I wheeled away to the sink and dumped my cold coffee. "Woman, don't you know what a risk you're taking? First of all, in not running like hell when I came up out of the sea naked? She gave me a phony little moue of exaggerated innocence. It was cute, but I shandered on. "Second, you're here alone—or so you tell me. No one to protect you."

She folded her arms, half covering her

turns at page 88





Through the years he had been waiting, with his friends beside him. They were still beside him as his waiting ended.

THE REASON WHY

fiction/Stephen Utley art/Monte Rogers

When the pain in his body began to ebb and forced him to admit to himself that his time had finally come, the last man in the world went to his crude cot to lie trembling amid ancient, soiled blankets. He lay there, waiting, almost until dawn.

Nothing was revealed.

The man sighed softly and fell into an exhausted sleep.

Later that morning, his animal friends came as they always had to the garden in the lot behind the rusted supermarket. They had grown very fond of listening to the stories he told and the songs he sang in his high, hoarse voice. When he failed to appear, some of the beasts crept into the disintegrating building and slipped into his little room to wait quietly in the shadows beyond a wavering perimeter of light cast by stub candles at the head of the cot.

The last man sensed their presence after some time had elapsed. He raised his head with painful effort and smiled into the darkness. "My friends," he murmured, "my good and dear companions, I am dying."

They knew. The odd cat gave a brief, warning howl. The big, orange dogs whimpered and ducked their heads. The lesser things that had come stifled nervously on small padded paws and sniffed the close air, trying to determine the seriousness of death.

"It is nothing to fear," the man gasped weakly as he sank back into his pile of blankets. "Remember that, my little ones, that and all of the other things I have told you."

Now that it really mattered, but *Moss* whispers the very last had once been called Alexander something, or something Alexander perhaps—there had come a time when he found himself unable to recall either the missing part of his name or whether "Alexander" had come before or after.

He had been a minister, a man completely dedicated to God. He had lived in a little brick house located next to a large brick church, and then, early one morning, the world had ended all around the little brick house. Muscled, unharmed by the final, fatal human folly, Alexander had gone out to find the earth second clean of his own kind.

He had been thirty-four years old at the time (not that that really mattered either, because he had soon afterward lost track of his years) and was convinced that the Lord God in Heaven had spared him, singled him out, for some great reason that would presently manifest

itself.

So Alexander had worked hard to insure his survival while awaiting the bolt from the blue that would make the nature of his post-apocalyptic mission clear to him. He had raised vegetables in his garden and made friends with such beasts as still sought the company of a human being, and he had kept on waiting.

When the last man in the world was very, very old, a slow, grey sickness had begun to creep through him and grow at his insides. For several weeks, he had coughed often and long, choking and spitting up thick, fibrous clots of blood and mucus, but he had continued to putter about in the garden, conversing with his mutely expressive animal friends, singing his old hymns to them, lying to himself.

Finally, however, he had had to face the truth.

He was dying.

No purpose had been revealed unto him.

No reason had been given for his exemption from the extinction of the human race.

It made everything seem rather pathetic and futile.

One of the strange dogs whimpered again and moved nervously from dark corner to dark corner. Smaller creatures scurried out of the way in panic as the jittery bear's nails clicked on the smooth stone floor.

The man stared up at the ceiling, his bright, bright eyes glowing in the deep, black-rimmed sockets of his pale and fleshless face. The pain inside his chest increased steadily as the long day wound to a close. He started sneezing at dusk and kept it up interminably until well after midnight. His waiting, watching animal friends stayed in the room the whole time.

Shortly before dawn, he grew quiet and lay with his arms pressed tightly against his numb, hollowed-out chest. He tried to focus his gaze on the watching beams and, failing, closed his eyes.

"Remember," he said again. "The songs, the stories, this place. Remember me. If you can."

He settled himself more deeply into his blankets and thought, *Dear Heavenly Father, the meek are truly about to subvert the earth. Is this what you spared me for? Is this all?*

He waited hopefully for the revelation that would snuff out the ember of angry doubt in his mind.

Nothing was revealed.

The last man in the world died as the sun came up. The beams edged forward one at a time to stiff at the cooling corpse on the cot. The odd cat slunk away, meowing pitifully, and the lesser furry things quickly followed. The strange dogs remained by the deathbed until mid-morning.

Then they gathered up their friend, bore him out to the garden and gave him a decent Christian burial. O



He didn't know why he had been spared, but he was sure there must have been a reason, and on this night, his last, he would finally learn that reason.

FOR THE GOOD OF SOCIETY

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sent, reaching his hand out to the slender woman in the 30-year-old beige coat sitting behind him. One test to the right. Her eyes were blackened and bruises on her face indicated a recent beating. Fred Robinson's eyes narrowed again as he looked at her face, narrowed as they had when he had first seen it, bloodied, just a week ago. He brought her hand to his lips and kissed it gently, shaking his head in a still unbelieving way at the events that followed her beating.

The Judge reached his decision with a clang. Robinson turned back around, leaning slightly forward, ashen-colored, the first sign of fear showing in him. His wife gasped and even Benson stopped fanning himself.

The bailiff took the readout card, and, holding it up to the light, translated its message.

"Guilty!" He continued reading. "The defendant, Fred Robinson, will be remanded to the State prison colony along with any dependents still of minor age and living at home or, marital connection for the rest of his natural life!"

Benson jumped to his feet and threw his arms around Robinson.

"I told you we'd win," he shouted. "You'll be happy in prison. They've got rules to follow, law and order, and you HAVE to work because that's the only place nowadays that manufacturers and farms and supplies Society with the goods they need. You'll be with people of your own kind. Decent people! Law-abiding people! All junks are chosen from there. We attorneys, too. That's all the Departments of Protection can do in this year of our Lord. Make sure we protect our decent folk from Society."

Neville, the prosecuting attorney came over. "Stone walls do not a prison make, always," he quoted. Then he smiled. "Scoundrels, they make a fortress." He shook Robinson's hand.

Robinson turned to his wife. He looked at the face that had been so brutally beaten by hoodlums the week before. He thought of his two sons, both renowned in their respective fields; one, a thief, the other a fence of stolen goods. His daughter kept herself supplied with drugs by being a hooker and also punks for teenage boppers. He shook his head once again. No, he and Edna were no longer fit to live in Society, the anarchic, lawless Society of 1993. That's why he had requested arrest. That's why he wanted to go to prison. So he and Edna could live without fear—for the rest of their natural lives.

LIFE AT A DISTANCE

from page 57



of years away in our genetic future.

The possibility of animal life on Mars is, seemingly, even more remote than plant life. This is a consequence of the general lack of accessible energy on the surface of Mars compared to a plant, even a small animal uses many times as much energy simply moving about as a plant does standing still in the ground. And whereas a plant can extract energy from the sun and its own supply of chlorophyll, an animal extracts its fuel from either plants or other animals. If only a few other animals are around to begin with, a carnivore has a difficult time locating food. And with plants as few and far between as exobiologists estimate they are on Mars, herbivores are in a similar spot. It requires too much energy simply to go hunting for more.

Another consideration must be made

The higher animals, including all mammals, must have a certain amount of "free water" which acts just to keep the kidneys functioning properly. For a human, the daily requirement is about a pint; smaller mammals need less fuel, but no animal gets by on none. This means that a constant supply of water must be available, and water is scarce on Mars. A portion of that "free water" goes to maintain the animals' correct body temperature, which is accomplished in many terrestrial creatures by sweating through the pores. For a Martian animal, in light of that planet's dearth of water, it might well be a serious drawback. Only a few Earthly mammals avoid this function. Elaine Morgan, an English anthropologist described one of them "a little kangaroo called *Dipodomys*, which lives in Arizona deserts so fearfully and that he can't afford to sweat at all, and he can concentrate his urine to osmotic levels over four times as high as ours—so high in fact, that after leaving his bladder it is apt to solidify."

Dipodomys, or a creature like him may have adapted to the Martian climate, but still it seems unlikely that any large beast is now padding across the dusty lowlands of Mars.

And what of Dr. Molten's third subdivision of conceivable life, the "exotic"? Exobiologists freely admit that any kind of life which is not, like Earth's, based on carbon is possible, but unimaginable according to scientific knowledge extant today. Discussing organisms with chemistries of silicon, or iron, or barium is often a stimulating intellectual pastime for professional exobiologists, but without greater knowledge it remains a game, for no one has the faintest inkling how such strange varieties of life could exist.

Our beliefs about extraterrestrial life are conditioned by what we know of our own chemical makeup, how it functions to keep us alive. Beyond that, everything is pure speculation, except for one aspect of all life-forms: intelligence. Concerning the prospect of other intelligent races in space, virtually all exobiologists agree on a single point.

"The quantum of intelligence," wrote Dr. Molten last year, "is a limiting factor cutting across all three classes, since we have no evidence that the existence of intelligence is limited to a specific chemistry. Just because we consider ourselves intelligent and have a carbon-hydrogen-oxygen biochemistry, does not mean that one entails the other."

DARK, DARK WERE THE TUNNELS

from page 45

him. They would never find the ways he had come, the twisting tunnels that led deep, deep into the earth.

So the People were safe if he did not act. But then the worm-things would win, eventually. It might take many generations. But the People could not hold out.

His decision. No mind-mangler could reach a small part of the distance that separated him from the tunnels of the People. He alone must decide.

And he must decide soon. For he realized, with a shock, that the fire-men were coming back. These odd thoughts grew stronger, and the light in the hall grew more and more intense.

He hesitated, then moved slowly backwards towards the tunnel from which he had come.

Wait a minute," Von der Stadt said when Cifonetto was a quarter of the way up the wall. "Let's try the other directions."

Cifonetto craned his head around awkwardly to look at his companion, gave it up as a bad job, and dropped back to the tunnel floor. He looked disgruntled. "We should get back," he said. "We've got enough."

Von der Stadt shrugged. "C'mon. You're the one wanted to explore down here. So we might as well do a thorough job of it. Maybe we're only a few feet away from another one of your big find."

"Alright," said Cifonetto, pulling his flashlight from his belt when he had studied it for his intended assault on the platform. "I suppose you have a point. It would be tragic if we got Nagel down here and they tripped over something we had missed."

Von der Stadt nodded assent. Their flashlight beams melted together, and they strode quickly towards the deeper darkness of the tunnel mouth.

They were coming. Fear and indecision tumbled in Grel's thoughts. He hugged the tunnel wall. Back he moved, fast and silent. He must keep away from the fire until he could decide what he must do.

But after the first turn, the tunnel ran long and straight. Grel was fast. But not fast enough. And his eyes were incautiously wide when the fire appeared suddenly in full fury.

His eyes burned. He squealed in sudden pain, and threw himself to the ground. The fire refused to go away. It danced before him even with his eyes closed, shifting colors horribly.

Grel fought for control. Still there

was distance between them. Still he was armed. He reached out to H'ang, nearby in the tunnel. The cyclops sat again would be his eyes.

Eyes still shut, Grel began to crawl back, away from the fire. H'ang remained.

What the hell was that?" Von der Stadt's whispered question hung in the air for an instant. He was frozen when he had rounded the curve. Cifonetto, by his side, had also stopped dead at the sound.

The scientist looked puzzled. "I don't know," he said. "It was—odd. Sounded like some sort of animal in pain. A scream, sort of. But as if the screamer were trying to remain silent, almost."

His flashlight darted this way and that, slicing ribbons of light from the velvet darkness, but revealing little. Von der Stadt's beam pointed straight ahead, unmoving.

"I don't like it," Von der Stadt stated doubtfully. "Maybe there is something down here. But that doesn't mean it's friendly." He shifted his flash to his left hand, and drew his pistol. "We'll see," he said.

Cifonetto frowned, but said nothing. They started forward again.

They were big, and they moved fast. Grel realized with a sick despair that they would catch him. His choice had been made for him.

But perhaps it was right. They were men. Men like the Old Ones. They would help the People against the worm-things. A new age would dawn. The time of fear would pass. The horror would fade. The old glories of which the taleless sing would return, and once again the People would build great halls and mighty tunnels.

Yes. They had decided for him, but the decision was right. It was the only decision. Man must meet man, and together they would face the worm-things.

He kept his eyes closed. But he stood. And spoke.

A pain they froze in mid-step. This time the sound was no muffled scream. It was soft, almost incoherent, but it was too clear to be misunderstood.

Both flash beams swung widely now, for seconds. Then one froze. The other hesitated, then joined it.

Together they formed a pool of light against a distant part of the tunnel wall. And in the pool stood—what?

"My God," said Von der Stadt. "Cif, tell me what it is quick, before I shoot it."

"Don't," Cifonetto replied. "It is moving."

"But—what?"

"I don't know." The scientist's voice had a stringy, uncertain quaver in it.

The creature on the pool of light was small, barely over four feet. Small and sleek. There was something vaguely manlike about it, but the proportions of the limbs were all wrong, and the hands and feet were grotesquely malformed. And the skin, the skin was a sickly, maggoty white.

But the face was the worst. Large, all out of proportion to the body, yet the mouth and nose could hardly be seen. The head was all eyes. Two great, amnestic, grotesque eyes, now safely hidden by lids of dead white skin.

Von der Stadt was rock steady, but Cifonetto shook a bit as he looked at it. Yet he spoke first.

"Look," he said, his voice soft. "In my hand. I think—I think that's a tool."

Silence. Long, strained silence. Then Cifonetto spoke again. His voice was hoarse.

"I think that's a man."

Grel burned. The fire had caught him. Even star light, his eyes ached, and he knew the horror that lurked outside if he opened them. And the fire had caught him. His skin itched strangely, and hurt. Worse and worse it hurt.

Yet he did not stir. He was a scout. He had a duty. He endured, while his mind mangled with those of the others.

And there, in their minds, he saw fear, but checked fear. In a distorted, blurry way he saw himself through their eyes. He tasted the awe and the revulsion that waited in one. And the unshared revelation that churned inside the other.

He angered, but he checked his anger. He must reach them. He must take them to the People. They were blind and crippled and could not help their feelings, but if they understood, they would aid. Yes.

He did not move. He waited. His skin burned, but he waited.

That," said Von der Stadt. "That thing is a man?"

Cifonetto nodded. "It must be. It comes back. It spoke." He hesitated. "But—God, I never envisioned anything like that. The tunnels, Von der Stadt. The dark. For long centuries only the dark. I never thought—so much evolution in so little time."

"A new—?" Still Von der Stadt doubted. "You're crazy. No man could become something like that."

REPENT OR WE ARE DOOMED



Ciffoetto scarcely heard him. "I should have realized," he mumbled. "Should have guessed. The radiation, of course. It would speed up mutation. Shorter life-spans, probably. You were right, Von der Stadt. Men can't live on bugs and mushrooms. Not men like us. So they adapted. Adapted to the darkness, and the tunnels. It—"

Suddenly he started. "Those eyes," he said. He flicked off his flashlight, and the walls seemed to move closer. "He must be sensitive. We're hurting him. Drown your flash, Von der Stadt."

Von der Stadt gave him a doubtful sidelong glance. "It's dark enough down here already," he said. But he obeyed. His beam swung away.

"History," Ciffoetto said. "A moment that will live in—"

He never finished. Von der Stadt was tense, jittery-edged. As his beam swung away from the figure down the tunnel, he caught another factor of movement in the darkness. He swung back and forth, found the thing again, pinned it against the tracks with a beam of light.

Almost he had shot before. But he had hesitated, because the ratlike figure had been still and unfamiliar.

This new thing was not still. It quivered and scurried. Nor was it unfamiliar. This time Von der Stadt did not hesitate.

There was a rose, a flash. Then a second.

"Got it," said Von der Stadt. "A damn rat."

And Grael screamed.

After the long burning, there had come an instant of relief. But only an instant. Then, suddenly, pain flooded

Men can't live on bugs and mushrooms.
At least, not men as we know them. But
men adapted by necessity and radiation.

him. Wave after wave after wave. Rolled over him, blotting out the thoughts of the fire-men, blotting out their fear, blotting out his anger.

Huang died. His mind-brother died. The fire-men had killed his mind-brother.

He shrieked in pain. He darted forward, swung up his spear.

He opened his eyes. There was a flash of vision, then more pain and blindness. But the flash was enough. He struck. And struck again. Wildly, madly, blow after blow, thrust after thrust.

Then, again, the universe turned red with pain, and then again sounded that awful roar that had come when Huang died. Something threw him to the tunnel floor, and his eyes opened again, and fire, fire was everywhere.

But only for a while. Only for a while. Then, shortly, it was darkness again for Grael of the People.

The gas still smoked. The hand was still steady. But Von der Stadt's mouth hung open as he looked, unbelieving, from the thing he had blasted across the tunnel, at the blood dripping from his uniform, then back again.

Then the gas dropped, and he clashed at his stomach, clashed at the wounds. His hand came away wet with blood. He stared at it. Then stared at Ciffoetto.

"The rat," he said. There was pain in his voice. "Only shot a rat. It was going for him. Why, Cif? It—"

And he fell. Heavily. His flashlight shattered and went dark.

There was a long fumbling in the blackness. Then, at last, Ciffoetto's light winked on, and the aches scented knelt beside his companion.

"Von," he said, tugging at the uniform. "Are you all right?" He ripped away the fabric to expose the torn flesh.

Von der Stadt was mumbly. "I didn't even see him coming. I took my light away, like you said, Cif. Why? I wasn't going to shoot him. Not if he was a man. I only shot a rat. Only a rat. It was going for him, too."

Ciffoetto, who had stood paralyzed through everything, nodded. "It wasn't your fault, Von. But you must have scared him. You need warning, now, though. He hurt you bad. Can you make it back to camp?"

He didn't wait for an answer. He slipped his arm under Von der Stadt's, and lifted him to his feet, and began to walk him down the tunnel, praying they could make it back to the platform.

"Only shot a rat," Von der Stadt kept saying, over and over, in a dazed voice.

"Don't worry," said Ciffoetto. "It won't matter. We'll find others. We'll search the whole subway system if we have to. We'll find them."

"Only a rat. Only a rat."

They reached the platform. Ciffoetto lowered Von der Stadt back to the ground. "I can't make the climb carrying you, Von," he said. "I'll have to leave you here. Go for help." He straightened, hung the flash from his belt.

"Only a rat," Von der Stadt said again.

"Don't worry," said Ciffoetto. "Even if we don't find them, nothing will be lost. They were clearly sub-human. Men, once, maybe. But no more. Degenerated. There was nothing they could have taught us, anyway."

But Von der Stadt was past listening, past hearing. He just sat against the wall, clatching his stomach and feeling the blood ooze from between his fingers, mumbling the same words over and over.

Ciffoetto turned to the wall. A few short feet to the platform, then the old, rusty escalator, and the basement rum, and daylight. He had to hurry. Von der Stadt wouldn't last long.

He grabbed the rock, pulled himself up, hung on desperately as his other hand scrambled and found a hold. He pulled up again.

He was almost there, almost at the platform level, when his weak Lunar muscles gave out on him. There was a sudden spasm, his hand slipped loose, his other hand couldn't take the weight.

He fell. On the flashlight.

The darkness was like nothing he had ever seen. Too thick, too complete. He fought to keep from screaming.

When he tried to rise again, he did scream. More than the flashlight had broken in the fall.

His scream echoed and re-echoed through the long, black tunnel he could not see. It was a long time dying. When it finally faded, he screamed again. And again.

Finally, hoarse, he stopped. "Von," he said. "Von, can you hear me?" There was no answer. He tried again. Talk, he must talk to hold his sanity. The darkness was all around him, and he could almost hear soft movements a few feet away.

Von der Stadt piggled, sounding infinitely far away.

"It was only a rat," he said. "Only a rat."

Silence. Then, softly, Ciffoetto. "Yes, Von, yes."

"It was only a rat."

"It was only a rat."

"It was only a rat."

PRAGMATIC TIME

from page 23

Las Vegas and Los Angeles as well. If nothing else, such a change would provide instant relief for the millions of people who, each day, travel across more than one time zone, or who have to make business calls into a different time zone.

The change to a single time for the whole country could be accomplished in two steps, to make the transition easier. The first step would be to set up two continental time zones, Eastern and Western. For our major overseas areas, Alaska would drop its four different time zones and go on a single time with Hawaii, while Puerto Rico and the Virgin Islands could go on the new Eastern Time.

During the first step of the change the current Central and Mountain Time Zones would not change, nor would they go on daylight savings time. These two zones would become the standards for the new system.

The current Pacific Time Zone would make the change simply by going on year around daylight savings time, in effect moving their clocks forward one hour to match Mountain Standard Time. This should not present too many problems, since the four states in the Pacific Time Zone all go on daylight savings time each summer anyway.

The most problems with Step One would be on the east coast, where the clocks would have to be set back one hour to Central Standard Time. The east coast is one of the two major business centers for the United States, though, and the change could not help but aid inter-time-zone business communications. In effect, the change outlined in Step One would multiply by thirty percent the number of hours the telephone could conveniently be used between coasts.

Because of the different starting, lunch and quitting times between, say, Los Angeles and New York, a person in Los Angeles can only conveniently call New York on business between 11 AM and 12 Noon (5 AM to 9 AM New York time), 1 PM to 3 PM (10 AM to 12 Noon New York time), and from 4 PM to 5 PM (1 PM to 2 PM New York time), for a total of four hours during an 8 to 5 day.

Under Step One he would be able to call from 9 AM to 12 Noon (2 AM to 11 AM New York time), and from 2 PM to 5 PM (1 PM to 4 PM New York time), for a total of six hours.

Quite aside from the problem of making business calls from coast to coast, our present system is still a mess, economically. Men who make their livings

THE EIGHT TIME ZONES OF THE UNITED STATES



ATLANTIC
12 NOON



EASTERN
11 AM



CENTRAL
10 AM



MOUNTAIN
9 AM



PACIFIC
8 AM



YUKON
7 AM



ALASKA
HAWAII
6 AM



BERING
5 AM

and departure times for distant destinations. And, perhaps affecting more people than any other factor, network television has to fight the time zones, spending millions each year in rescheduling, rescutting, and rebroadcasting thousands of hours of programming during prime time hours, which vary across the country. The networks have, though, anticipated at least part of the change to U.S. Standard Time by combining Central and Eastern Time into one large zone.

Jet lag for air travelers is a real and serious medical problem which affects the normal eating and sleeping patterns of passengers arriving at a trans-continental destination. Man's long evolution has revolved around the circadian cycle, where man is "up" for twelve hours and "down" for twelve hours. This is no real problem as long as he doesn't do any radical time-zone changing. When he does, though, traveling clear across the country in a matter of hours, he finds himself eating breakfast when his body knows it's long past bedtime. This problem would be greatly lessened by Step One, and eliminated completely by Step Two, the integration of the entire U.S. into one time zone.

So how well it all work out? How will the change be made? Really, quite simply. As already outlined, Step One would form two zones instead of four, thus making the difference between New York and Los Angeles only one hour instead of three.

This would be done by combining the Eastern and Central zones, and the Mountain and Pacific zones. We would now have only the Eastern (now called Central) and Western (now called Mountain) time zones. This would result in no change across most of the country and a change of only one hour for the two coasts.

Now there would be no time change on flights or calls between New York and Chicago, Memphis and Atlanta, New Orleans and Miami. In the West, travel would be without the current one-hour gap between Los Angeles and Denver, Phoenix and San Francisco, Seattle and Salt Lake City.

The final step would be to combine the remaining two zones into a single zone from Maine to California. At that time we would have to change our clocks only thirty minutes. The east would turn its clocks back thirty minutes, and the west would move thirty minutes ahead. The entire country would then be on one standardized time. It's a change that will help every person in the country. O

from the stock market are especially affected. Since market operations must begin simultaneously across the country, to prevent trading advantages, brokers in Los Angeles must arise three hours earlier than their eastern counterparts in New York in order to be ready for the market's early morning operations.

Shippers must constantly plot arrival

AZTEC MEDICINE

from page 27

eries—even in the nineteenth century—hospitals were totally lacking in sterile techniques, and patients died like flies from putrefaction, tetanus, and gangrene, with which they became infected after admission. Many a filthy hospital failed to change blood-pus-and-excreta-stained bedclothes between patients. And many a European doctor proudly wore his blood-and-pus stiffened surgical gown on his rounds unaltered by soap and water from one year's end to another, as a walking advertisement of his professional popularity."

Aztec doctors were generally specialists; there were obstetricians, gynecologists (usually women), internists, surgeons, and, of course, dentists. Even psychiatrists. Medical schools were conducted by priests, but one could also become a specialist by apprenticing himself for several years to a master in his field of choice. Women were free to enter into the practice of medicine as a profession if they chose to do so.

Trepanning the cranium for relief of pressure caused by wounds, tumors and even perhaps to release "evil spirits," should be mentioned here. The operation, a most delicate one, was widely practiced by the natives of the New World. The Aztecs bored a series of small holes in the skull, cut between the holes and removed a section of the cranial bone. After surgical repairs were made the exposed section of the brain was protected with a thin plate of hardwood or metal and cotton.

Aztec surgeons were experts at several very delicate operations, the most notable of which was probably one performed on the eye to remove small tumors and perhaps cataracts. For suturing they used human hair.

Cortés described Moctezuma's zoos and botanical gardens and thought of them as being very interesting curiosities. The zoos contained animals, birds and reptiles, including a bison from the plains of North America. The botanical gardens, as described by Spanish writers, contained as high as two thousand different species of plants and were no less than five miles in circumference. But they were more than just "curiosities." They were for the specific purpose of providing Aztec doctors and researchers with raw material for medical experimentation! Nothing of the sort existed in Europe nor in any other part of the

world at that time. The list of pharmaceuticals used by the Aztecs and still in use today number into the dozens, virtually all remedies used by European physicians at the time of Cortés have been discarded.

In Moctezuma's Mexico the poor were given public assistance, the crippled, blind and other afflicted were cared for in state supported homes. There were asylums for persons with both curable and incurable diseases, the latter being isolated and removed from population centers.

In Europe at the time of Cortés' conquest there was but one manner in which a young man of moderate means could receive a formal education—and that was by entering a church order. For most women a formal education was beyond consideration, only a few very wealthy and very enlightened bothered to hire tutors to teach their daughters to read and write.

Aztec schools, as were the hospitals, were state supported, and it is generally supposed that they were open to all. There were two distinct classes of schools: one run by professional educators and the other by the priests. The former were divided into what might be called "trade" and "professional" schools. In the colleges conducted by the priests, students were taught astronomy, history, mythology, religion, law and even how to speak proper Nahuatl (the language of the Aztecs).

Besides medicine, there were at least two other scientific fields in which the Aztecs far surpassed the European civilization: mathematics and astronomy. Very probably they inherited much of their knowledge of both subjects from the Mayans, who had discovered the concept of zero and were using it as early as 2,000 B.C.

In astronomy, and without the use of any sort of magnifying device, the Aztecs were centuries advanced beyond their European counterparts. They had learned and mapped the movement of the stars so well that they could predict eclipses of the sun and moon with complete accuracy centuries in advance.

Of course, everyone is familiar with the great Aztec stone calendar, which has been reproduced on countless wall plaques, pendants and whatall. The original, now in the National Anthropological Museum in Mexico City, weighs twenty-four tons and contains twenty-four symbols inscribed in concentric rings about a mask of the sun god. Completed in 1479, it still has not

been completely decoded. But it has been determined that the Aztec calendar was more uniform, more convenient than, and at least as accurate as the one the world was today. There were eighteen months of twenty days each in the Aztec year, with the five remaining days designated as "ill omen" days on which no ceremonies were held. Then, after the Aztec "century" of fifty-two years, thirteen days were set aside for a very serious religious ceremony that consisted of a renewal, or rebirth. The completed Aztec cycle brought these calculations to within a dozen minutes of absolute astronomical exactitude!

It was not only as scientific endeavor that the Aztecs were as, or more, advanced than the Europeans of their day. Their government was, as William H. Prescott termed it, an "elective monarchy" and was considerably more democratic than any of Europe's absolute monarchies, women were allowed to own, buy and sell property and, as stated before, enter the professions, artistic achievement was awarded by the State and the result was enjoyed by all.

The one great flaw in Aztec society was the belief in the necessity of human sacrifice. And while that cannot be excused, many a historian has pointed out that Europeans of that era were just as bloodthirsty on the field of battle—and also in the name of religion. It was in the name of religion that the Spanish priests destroyed a wealth of knowledge contained in Tenochtitlan's great archives and libraries. And it was in the name of religion that Cortés destroyed that beautiful city—a destruction that was complete. It is estimated by most historians that Cortés and his Indian allies killed over two hundred thousand people there. In the words of Bernal Díaz, cousin "I say so thick that one could not tread either among the bodies" and Cortés proudly stated that "A man could not set his foot down unless on the corpse of an Indian" when he was thorough with Tenochtitlan.

The citizens of that fair city, William Prescott wrote, "were piled one upon another, the living mingled with the dead. They stretched themselves on the bodies of their friends, and lay down to sleep there. Death was everywhere." And finally, after Cortés was finished, Tenochtitlan knew plague and pestilence. The stench of death was so horrible that even the Spaniards had to withdraw from the city. They left behind more than bodies, they also left a wealth of scientific knowledge unequalled to recent times. G



Even the bravest
follower must have a
leader if any venture
into the unknown is
to stand a chance of
success, no matter
how slim the chance.

I crouch at the edge of the forest, careful lest a ray of sun strike my metal body and betray my presence. Even if my good arm would be no protection against the Evil That Comes From the Sky.

My two comrades are concealed nearby, awaiting the retreats of Our Leader, who is scouting for possible dangers on the road.

My comrades. Three days ago I knew them not, yet we have since passed such dangers together that we are closer than brothers. Had it not been for Our Leader, we would still be sub-human creatures upon whom even despair had sickened.

For years, I was a mockery of a sentient, human-like in form but with no soul, no love, no hope. And my comrades were the same, one was impaled like a rag on a rock, and the other crept furtively through the forest, dying a thou-

sand deaths each time a shadow fell or a leaf rustled.

But then our leader came from a place called Earth and taught us that, though we were not to mankind born, yet could we achieve humanity by casting off despair. What a rare place this Earth must be to engender such a being.

We learned that courage and love and hope enable us and make us more than the rocks that endure through the centuries only to crumble into forgotten dust in the end.

Then joined we hands in a solemn pact to quest for our salvation even in the face of winter and terrible destruction. My soul is bound to them and, if we die on the road, it will be as free men under an open sky, fighting bravely until the last. That knowledge is sweet and comforting.

Something moves on the road ahead. It is too distant to discern. I sense that my comrades are aware of it even though no sound or movement betrays their hiding places.

My hand grips of itself on my axe and wild surmise thrills my brain. I tremble but it is not alone the anticipation of death.

Yes! It is Our Leader, hurrying toward us and beckoning. I stand erect and my comrades emerge as we walk out together to meet Our Leader as a rainbow arches suddenly across the sky.

We embrace her wordlessly and then the four of us, arms linked, step bravely out on the yellow brick road to follow our quest to Oz. ☺

THE QUESTERS

Fiction/Herman Wrede

Art/Albin Austin





"It would be wonderful if a writer were omniscient and knew everything about everything he touches on, but most writers are not in that position and the idea is to arrange the story in such a way that his ignorance doesn't disturb the reader."

any little twists on them. But when you first read them you don't realize that they're the product of slow development by many minds and it's very exciting. After you have read it for a year or two and find these same ideas coming back again and again, then, unless you have a special turn of mind, you're going to get bored by it. The sense of wonder has disappeared. So you stop reading SF.

VERTEX: What is that special turn of mind that attracts people to begin with?

COLEMAN: One answer is superior taste. Maybe superior neuroticism. I suspect the truth lies somewhere in between, but just where I don't know.

BENFORD: I don't think it is superior anything. It is just a quirk of taste. Taste is basically inextinguishable.

COLEMAN: There is a lot of SF that is very good by anybody's standards. Not just by our standards, but by F. R. Levenson's standards, by Edmund Wilson's standards.

BENFORD: Why is it that these gentlemen have never recognized it?

COLEMAN: SF has a bad name for a lot of complicated reasons that we all know about. In a lot of people's minds, SF is still *Creature Features*, *Back Rogers*, and comic strips, although that is beginning to disappear.

VERTEX: Pulp. That was its original bad name—pulp fiction.

COLEMAN: Also, finding good SF requires a certain amount of

investigation, a certain amount of patience. If I just tell someone, "There is very good stuff in SF," they say,

"O.K." and go down to the drugstore and buy the first SF novel they pick up, probably *GANDOR AND THE THREE-BREADED QUEEN OF CALISTRO*, or something like that.

So they decide that I am crazy and their original opinion was right. You have to be very careful. If I give them *THE LEFT HAND OF DARKNESS*, or something like that, they will agree—this is very good stuff. I have

become the SF connection for some people. Whenever I come into town they say, "What are the good SF novels that have been written since we last saw you?" They have no intention

of plowing through all that garbage themselves to find out which the good ones are. Most of it is terrible.

BENFORD: I think any flaw in a work of fiction, any flaw visible to a reader, tends to discredit the work.

VERTEX: You're talking about fiction in general?

BENFORD: Right. In SF you have the odd circumstance, as you do also in mystery fiction, that some small fraction of the populace will be specialists in the area. In the true *lin-bo* sense of the word, this doesn't matter. On the other hand, for a small minority of the populace, a scientific flaw is a disturbing element and destroys some of the enjoyment of the story. This is unavoidable, but there's no point in not admitting it.

COLEMAN: Oh, on that level I agree with you. For example, if you know any biology you will find James Blisk's *SEEDLING STARS* extremely disturbing. Or if you know any physics you will find Paul Anderson's *TAU ZERO* extremely disturbing. But that's not the point. The writer is not writing for that narrow specialized audience. I think he's writing for a larger audience, and for that larger audience it is quite legitimate to take it. I think it was E. M. Forster who said, in the introduction to one of his short story collections, that one of the largest parts of the writer's art is the art of faking it. That's really true. Of course, it would be wonderful if a writer were omniscient and knew everything about everything he touches on, but most writers are not in that position and the idea is to arrange the story in such a way that his ignorance doesn't disturb the reader.

BENFORD: But even the ordinary reader of SF can find large holes in a number of prominent works of SF. Non-specialists I know could destroy, and did destroy within a few minutes, the entire background of such popular novels as, say, *THE ANDROMEDA STRAIN*.

COLEMAN: But *THE ANDROMEDA STRAIN* is something different. There the problem is not scientific accuracy but ordinary sensibility. The worst thing to be said against *THE ANDROMEDA STRAIN* is not that it kills you lies about biology, but that it tells you lies about how people behave. *THE ANDROMEDA STRAIN* is a bad book because the characters' behaviors are not rationally motivated.

VERTEX: Why do you read SF?
BENFORD: I read SF because it has the capacity for changing one's head around in a way conventional fiction seldom can. It can reach states of metaphor which are unapproachable by any other method. Perhaps the eventual impact of any SF piece is dependent not so much on how much correct science it has in it, but on how much it incorporates this into some other literary values we could name. It is more the max in SF that is important. It is certainly not the hard science element itself that people read it for.

I don't read SF for the hard science, though it is an interesting game to play, to find the author's mistakes. Larry Niven's *NEUTRON STAR*, for instance, was very well plotted, but it

*"I have my own ideas
about the future.*

*I think that if
the on-going
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realizable prospect
which we can
determine now—if
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SF will persist.*



had a large scientific error in it. The hero defeats the tided stress placed on him by the neutron star by, I believe, getting into the middle of the spacings, which, in fact, is a completely invalid trick. The only way to relieve tided stress is to roll up into a ball, and even that wouldn't save you.

COLEMAN: One of the few circumstances in which asserting the fatal position is a rational response to danger.

VERTEX: Who do you feel are the best SF writers today?

COLEMAN: Ursula Le Guin, Tom Disch, Bob Silverberg in his good moments, although he has many bad ones, Ted DeLaney.

BENFORD: I don't like to make lists of SF writers, because everybody in the field is relatively even except Ursula Le Guin. Certainly, for people currently practicing now, I would have to subscribe to Sid's list.

COLEMAN: Throw in Joanna Russ.

BENFORD: Right, though she's probably the most uneven of the top-flight crew. You might notice that all of the people we listed are not those that you might classify as hard science SF writers.

COLEMAN: There are some people that you might classify as hard science SF writers that I would put in the list of very good second rank writers.

BENFORD: Paul Anderson, Larry Niven.

COLEMAN: Yes, and in that list I'd stick people like R. A. Lafferty.

VERTEX: Of the SF writers, who do you feel have the best science in their fiction?

COLEMAN: Hal Clement is usually impeccable.

BENFORD: Yes, but he's not a very interesting writer.

COLEMAN: *MISSION OF GRAVITY* is a remarkable work of discipline and imagination, even though all the characters in it speak in the same voice.

BENFORD: Paul Anderson. He knows when he is showing the game, when he is making a mistake. He knows when to fudge the science to make his plot work better, and that's the only important criterion you can place on somebody's science that you keep it straight unless it conflicts with important literary elements. Paul Anderson has very good taste in this way. What's more, his sense of the poetry of sciences is, I think, a very important element both in his work and in the whole role of science in

SF. People like the poetry of science. There is a great deal of wonder to the natural universe, and the ability to convey this in a piece of fiction is an obvious asset.

COLEMAN: Arthur Clarke, I think. Of course, Arthur Clarke has two modes of writing. There are stories like *EARTHLIGHT*, and there are stories like *THE CITY AND THE STARS*, and it's the former mode I am discussing. In that mode his science is usually very good.

BENFORD: Henslein, particularly in his juveniles.

COLEMAN: Yes, the Heinlein juveniles are outstanding examples of good science for SF, but to take something from physics, which both Greg and I know well, the treatment of relativity in *TIME FOR THE STARS* is ludicrous. That doesn't keep *TIME FOR THE STARS* from being a good book. It is a good book.

BENFORD: But the important thing is that book is that Heinlein at least knew something about relativity, and he was able to create a verisimilitude which made people accept what was going on in the pages of that book. If Barry Malberg had done it—he may, in fact, know more about relativity than Heinlein did or does, but Malberg would make it appear intrinsically unreal for his own purposes. It is that which I think a large number of people who read SF won't accept, because they want to believe that what they're reading

could be real. They accept fiction that talks about the future as a real place, as a real metaphor.

VERTEX: Let's talk about the future of science in SF and about the effect on SF of our present technologically oriented society. Where do you think it is going?

COLEMAN: I don't know. The more I learn the harder I find it to predict the future. I just refuse to discuss the point. Maybe Greg is bolder than I.

BENFORD: Well, I have my own ideas about the future. I think that if the on-going feeling of optimism continues, the basic feeling, say, that there is a future and that the future is a realizable prospect which we can determine now—if that persists, then SF will persist. And it will probably have a far technological component because the mix of change of the technological background is getting more and more rapid. If the rate of change declines, then SF will probably decline.

Certainly, I think one of the major things that will assimilate us to change is SF. There will ultimately be a social change, instituted either because of technological change or because of inherent social trends: say the collapse of the United States, with its high-technology society. That sort of thing would spark and continue the need people have for adjusting to events.

VERTEX: Thank you very much gentlemen. □

SPRINGTIME, A.D.

from page 75

pett bosom. "From what?"

"From rape, darling!"

"Hah!" Lurane took a sip of her coffee, sighed, eyed me as if I was something to be endured.

"Yes. 'Hah' indeed," I proclaimed. It sounded ineffectual, even to me. Lumpy, even. I changed tack. "How did you get here? When are you going home?"

"I got here . . . Well, it was difficult. And as to when I am leaving, that's up to you, Ben Thornton."

Visions of angry males, enraged with jealousy or protectiveness, returned to me and I said she'd better go right now. If this goddess truly was unhinged, I kept telling myself, only a flask would take advantage of her.

Lurane got up and pulled her little front strap the set, but one of the straps caught on the inner knob and the fabric ripped free at the shoulder. I saw she wasn't faking it, for tears glistened in her eyes. She put the brief costume on, avoiding my gaze now, and listlessly tied it in back. She seemed not to be aware that one breast was exposed. And suddenly I was struck by her resemblance to those bus reliefs of weeping women on the walls of Greek ruins.

In the hifist of voice she said, "Everything went wrong. I am sorry, Ben Thornton. Goodbye." She left, crossed the deck, went slowly down the steps, then trudged out across the sands. For the first time I noticed how small she really was. A very little over five feet. A sad little pocket-Venus. I took a deep drag of my cigarette. My hand shook slightly, and I hated myself for the pride I took in my self-control, because I knew it to be based on fear, mainly, and not upon consideration.

But the quote came to me. "Behold this madness . . . thy glory of flesh." Who'd said it? What Greek. Roman? I had *Amore* on the brain!

To shake the fantasy of a time-traveling nympho from 50 A.D., I switched on the radio to a low background of classical music and postcard commercials and idled up the kitchen, resolutely not going out to peer after my recent visitor.

And then I read some. And then I broke down a surf-cutting reel and oiled it and put it together again. And I listened to the noon news, but no one was missing a naked beauty. And I found a few dozen other trivial things to do, but they didn't help fill my day—they emptied it, and I cursed Lurane Malloy (unlucky name!) for violating the privacy of my beloved universe, my beach, for imprisoning me in my own house.

The day wore on, becoming dark and

cold with overcast, and finally . . . when I discovered I'd reduced myself to the indignity of watching daytime television. I swapped off the set and said to hell with it and took a long pull of scotch. From the bottle! The legend on the label proclaimed the booze to be ten years old, and it occurred to me . . . for the first time . . . to wonder about Lurane's age.

She could be twenty, or easily twenty-eight. Or for that matter . . . and I chilled . . . seventeen! A kooky nympho kid, on the make for an older man, someone her dad's age. A tow to bring about to her club of sly water-debauchees.

And now, spurned, sore as hell.

So she'd beg and lie, naming names and places . . . mine. Inventing a day of blossoming organs for her little-minded, big-breasted buddies to slobber over. And to tell their parents about.

For the first time I went to God. I had a phone. At the very least I could then go on record as having called the sheriff's office in Malibu . . . nine miles away, that a maniac kid was here and running loose. I took another swig of scotch, but this jolt went down with fish hooks in it.

Was she still listening around?

It had begun to drizzle, but the view from the deck disclosed no teenager. I hoped it would soon like hell and wipe out the incriminating tracks in the sand of her coming and going.

Shortly after dark I got my wish, for it began to pour. It was doubly satisfying to me, for I knew that not only would the footprints and her sandalprints be erased, but that my twentieth-century brains would have long since headed for home.

She knocked and called out just as I was warily relaxing.

"Ben Thornton! I ask you in the name of hospitality, let me in to warm and I will stay clothed!"

As I moved to the door I realized she was no teen-ager. Her was a mature voice. However strange her workings, the voice of a woman in need, and tinged with weariness. I let her in.

She was, of course, sodden. I put a stiff brandy into her shaking hands, and a thick towel about her shoulders, then firmly pushed her onto the sofa. I went to the bath and started a hot shower. When I came back she was still shivering, but she managed a wan smile before finishing her brandy. She offered no resistance as I removed the towel, undid her sandals, then managed to get the single soaked garment from her glorious body. I led her to the shower and steered her in. Lurane gave a sharp exclamation

as the hot water stung at her, then moaned contentedly. I shut the glass door.

I was committed.

WHEN FINALLY she emerged, she was wrapped in an old terry robe of mine, with a towel arranged turban fashion to cover her wet hair. She walked with dignity. "I want something to eat, later, and the use of your dream for the night. You will be paid for this, and in the morning I will be gone."

Again, I wasn't too sure of her age. Scrubbed, fresh, she looked about sixteen. "How old are you, Lurane?"

"Twenty-eight. Why?"

"Never mind. I'll get you something to eat. And you don't have to pay. For food or for a night's lodging."

"You think I can't pay?" She swept by me out the deck door, head high. Moments later she was back, indifferently tracking sand on the carpet. She held up a small purse, a simple draw-string bag of what looked like suede. It, too, was encrusted with wet sand. Obviously, she'd ditched it before entering.

"You wouldn't happen to have a devil's license in there?"

She brushed sand from the pouch and unsnapped it. "What's that?"

At my shrug of defeat she pulled the neck open and poured out several small glinting objects on the bar top. "What is that enough for your trouble?"

I knew enough about gems from a college course in mineralogy so he nearly-nine percent certain they were diamonds. "Where did you get these?"

"From a hiding place in my house. Yesterday." She glared at me with an intensity that convinced me. Maybe she was a nut, I mused, but she was a wealthy one.

"Put them back, Lurane. You don't have to pay for anything. But someone saw as hell ought to upbraid you for flashing them at strange men. And for that matter, for flashing yourself at strange men." I had a quick image of spanking those lush young buttocks, then as my imaginary blows became softer and slower, I snugged to and bussed myself with pouring two brandies.

There was a hint of humor on her face as she put the diamonds back into the pouch. She caught me watching. "Would you take just one?"

I won't say I wasn't tempted, for one of those gems would probably pay for another year of living here, but I shook my head no.

She took the drink I offered. "We'll see."

"Yeah. Well. . . I didn't know what

to make of her small secret smile.

"What's that?" Lurane indicated my tape recorder with her outstretched glass. And I'd had about enough of her "I'm a stranger in a strange world" nonsense, so I said, "It's a Sledgehammer Naturally."

"Naturally," she echoed quietly.

"Oh, for God's sake!" I switched the recorder on and went into the kitchen to make up some cuts. In a few moments a tape I'd put together of precious old 78s and recent L.P.s began going out with soft, easy, gentle jazz. Monk, Oscar Peterson, Mel Henke—that sort of thing, with crescendos by Tanam, Pine Top, and some magic solo by George

Lurane laughed, held out her glass. "So?"

"Oh." Maybe this was the answer. Get her thoroughly loaded and blotto—bottle her up, and let her dozing presence be the ball out of my sight into the bedroom. And maybe a few more fingers of Hennessy would show some truth from her. I poured two more inches of brandy in her glass. "That's enough for now."

I went through the brilliant Tatum tradition of window wine for so as she took a couple of big sips. "Where are you from, Lurane?" I put it as kindly and as casually as possible.

The girl stared down into her drink,

I wouldn't give it up. "How near?"

"Near where you first saw me, Ben."

"I see." I lighted two cigarettes and gave her one. She rolled over onto one elbow and puffed like a beginner.

"Come on. Level with me, Lurane."

She lay back, full length, put one forearm over her eyes. "Let's listen to the music, Ben."

"Are you in trouble?" I sat near her, sat almost over her on the sofa. I could not ignore the ivory columns of her thighs.

"Trouble?" She wanted a bit, then sighed. "Yes, I suppose I am."

"With the law?"

"No. Definitely no."

"Personal problem? Are you married?"

"No, Ben. Are you?"

"No." I swallowed the brandy about slowly. "Tell me one thing, why do you pretend you don't know what some things are?"

"Things?"

"Sure. Like the TV set, driver's license, recorder. Like that."

She sat up, stared me with great dark moored eyes. "I forget sometimes. But it doesn't matter now. It will come back to me."

Lurane pushed the turbaned towel from her head, unfolded it and began drying her helmet of dark brown hair. "I can't explain it all now." She put one hand on my knee. "Trust me, Ben. Maybe I can tell you later."

I guessed it was all I could hope for. I squeezed her hand briefly, then settled back against the cushions. We went without speaking for a few minutes in an easy silence, then I got up and built a small wood fire in the chain-link Danish steel hearth suspended in the opposite corner.

Lurane eyed it fondly as one would an old friend. I thought of braziers glowing in Atrium temples. Before the tape had spun out we each had another drink. Lurane took hers over to stand before the fire. "What do you do?" she asked.

"Why do you live here?"

"Well, child—"

She giggled. "Child? I'm older than you, Ben."

"I don't get that. You said you were twenty-eight. I'm thirty-three."

"Never mind. Tell me what I asked you."

Why, I supposed twenty-eight was older if one had been born in Pliny's time.

I gave it to her quick and condensed: Chicago advertising executive, eleven years with the same agency, twenty thousand a year. My two best friends,



Showering.

I built a couple of chicken sandwiches for grilling. Lurane, meanwhile, seemed entranced by the music. She'd settled on the carpet between the two sponsor grills, sitting cross-legged, in wanton disregard to the fact she'd bared her classic legs from toes to dams near hips. I caught myself thinking that she looked with the avidity of one who had never heard such music before.

Of course, I thought. Naturally. Pine Top. Smith didn't get around much in ancient Athens or Rome or Pompeii.

Stop it!

What's a driver license? What's a TV set?

Behold this fish!

"Food?" I asked flatly.

She shook her head. "Not yet." She held up her glass. "This has made me un-hungry."

"Un-hungry?" Sheer! "It will also make you drunk as a goat."

Although he wasn't sure why, he knew he must commit his life, his very being, to the future of this young woman.

looking slightly to the thirty year old man.

"Where from?" She laughed shoddily, leaned back on her elbows and eyed the heated ceiling. "Near here, Ben. Thornton."

"Just Ben, please."

"Near here, Ben."

also ad men, killed in crash of company plane. Enor doubt. What the hell had they been slaving for, so long and so tirelessly and with such little enjoyment? So Ben Thomson had had a brooding re-evaluation of his values and he decided to cut out. His boss, surprisingly understanding, termed the leaving a "sabbatical."

But I'd sold my plush bunny pad of an apartment, bought an old panel truck and sleeping bag and camping gear, and had followed the back trails—west from Lake Shore Drive, west through Mankato, Minnesota, down to Grand Island, Nebraska, through Sterling and Greeley and Leadville, Colorado, across the Rockies and the Sierras, and after another month of wandering, to here—Dune Beach, my hidden cove ten miles from Malibu. To this house which was a shack six months ago before I loved it and went at it with paint and hammer and a faithful lot of my savings.

"And now, Ben, what do you do?" She came nearer to where I sat, sat. She looked down at me with what seemed humbly like affection.

I wanted not love and I implied it.

"Do? Well, I enjoy my privacy. I do as little and as much as pleases me. I read, swim, sun. I go fishing. I listen to music. I'm alone and I love it. I have only myself, and I am a little proud to find that this does not make me feel poverty-stricken." I finished the rest of my brandy. "What shall I do next year

when my savings vanish. I have no idea. But that's a long way away. I'll figure something."

I made another drink. In fact, I drank too much. Far more than she. I remember that she had me put on another tape. I remember, dimly that she led me to bed and helped me out of my clothes, then pulled the covers over me.

And I remember more vividly than anything else in my life that sometime in the morning—dark rain pelting down—Lulust slipped into my bed.

What can I say of our love, our loving?

It began in gentleness, with warming, with the tactile thrill of this small strange woman close against me, the greening up to her nakedness, the knowledge that for at least a little while—here in darkness, I had an end to loneliness. A loneliness I had not before been aware of, or had refused to recognize.

And it built from there, slowly to an incredible height of delight that was her tongue-whisper, the touch of her hot and skilled hands creeping down me, the satin-strong smoothness of her gliding, soothing legs, and we were tipped over into that sweet delirium of honey-moust sexual heaven.

It was the finest I had ever known.

And when it was over for the while she wept briefly, then clung to me, making tiny gasping sighs, interspersed with contented chuckles and whispered endearments. And—miracle of her arranging, her needs, her supple arts

we were still intimately together when we slept.

In the morning she was almost bawdy in her delight and readiness, and the room was warm with a fire she had lit an hour or so before. With grins and laughter, with cooing impish persuasion, she played the man, the upper role, and after that she invaded my shower and dove me quite out of my mind, and there was a further affair of soapy wet limbs and breasts and chests and slippery clackings—until there came that deep erotic glazing of her eyes and the urgency and we were locked together in a mindless, starchy convolution on the tiles to trade souls with our bodies.

Until the hot water ran out suddenly and shattered the splendid commitment of our sanity into my shock, to gasping laughter.

That day was warm and we swam naked, later to close away the afternoon, secure in passion, holding hands when that was all we could do. The world for me, for her too, I believed—was a thousand miles, a thousand years away.

But evening came, and I found her studying me, a bit withdrawn. I realized she was reticent for conversation to turn to herself. So I didn't try. Instead, I told a self-deprecatory story of my fantasy in which she'd been an ancient Greek call-girl. This caused her to frown at me slightly but steadily as I spoke, but then to grin. As I talked she toyed with my transistor radio. Finally she had the back off and was examining it idly. "But Ben," she said finally, "you seem so rational, during. How does she get here—your adorable *knave*?"

"Simple," I told her. "Witchcraft. You know—daggers on the floor of the temple, words intoned, but hidden and hidden tongues burnt, then Zap! You're here." I reached out for her. She wore an old flannel bathing shirt of mine which reached almost to her knees. Just a buttoned shirt—three buttons only. Nothing else. I know... I'd dressed her.

She didn't elude my reach but she held up the opened transistor and pointed to its plastic housing. "What's that?"

"Well, honey, I'm not an engineer, but I'd say that's a printed circuit." I went into a left-footed explanation that an electrical diagram is caused to be printed in metallic inks, conductive inks. And that through the circuit the electricity travels to all the transistors and resistors and other arcane items so that the power can yank in broadcasts.

She cocked a wryly superior eye at me. "Ben, dear, would you explain electricity to me. I know I'm horribly stupid,



"Stupid tourist! He thought I was a parking meter!"

but would you?"

"Oh, you darling!" I thought. I wanted to smack her. I told her it was a force, she asked me to define it, and I gave up in a couple of minutes. The damn stuff is just as baffling now as when Franklin somehow escaped frying himself with that kite.

Like most women, she was a sore winner. "But if you don't know what electricity is, then why is it impossible to conserve of some other sort of power using what you call printed circuits?"

"Like what other?"

"Like the power of the mind that's been trained to focus in a certain way, then to be sent traveling along a diagram."

"A circuit? You don't know what electricity is, so . . . well . . . how can you deny mind power, with power?"

She mood in her cock-a-hop attitude, one hip thrust high, legs apart, hands on hips. I could not answer her quite reasonable question, though it disturbed me briefly.

So we made love.

It was something we did often during the following days. Often and unpredictably, no time-table, which is the most marvelous way of all to make love.

And I admitted to myself that my heart was involved with this woman, this stranger-pecken-versus-dauntingly-odd little child and woman. Almost reluctantly I admitted it, for I was forever in love with her.

SHE WASN'T there one morning, weeks later. I looked out over the deck and saw her sandaled footprints track down into a tangle of lines that had been drawn into the sand. But the bottom of the design has already been smoothed away by the incoming tide.

I recalled that an hour or so ago I'd been briefly awakened by the small but sharp crack of an explosion. But I'd thought it a slap of surf then.

I grasped the deck railing, sick, already beginning to understand. Her footprints reached down from the deck steps to the corner of the elaborately traced maze. Along the lines were odd clots of tiny drawings—circles within circles, vases, interfering S shapes.

Transcubes, omniscion, arcane items.

Her footprints ended at the center. I guess I realized then that the snap-crack I had heard was not an explosion but an applause . . . the sound of air slamming into a gap, a precious gap about the face, three inches high.

A COUPLE of days afterwards, I found the diamonds, and I converted them to cash—with meanness, and,

I guess, considerable loss because of my amateurish taste. But I bought my small coat and there's a high fence around it now.

Why? Because Lurane left me something else besides the gems. It was in the leather pouch, a folded clipping of what I gather was from a newspaper. A then clipping, this is true.

At the top there is this picture of a house—a comfortable A-frame type structure, but it juts from the top of a giant boulder, out over the water, without support. It is situated at the far end of our cove. Lurane wanders in front of this house. She wears a small smile, sandals, and that kittle which I still have in trade for a sloppy sweat shirt that I delighted in her wearing.

The story reads:

First graduate of Poona, Time-training lab in New LA stands before home granted her by Unworld, Geneva. With home goes privileges and sale of Countess.

After completing her quota of two hundred lovers (no more), Lurane of Malibu strand, found high-potential in psi-potential. Has already made backdoor tops of up to three years.

Of thirty-seven, mind-qualified women, now located in Time-training, she will be first to Go Back in attempt to return pregnant. Officials, Geneva, state this is final hope of avoiding whimper end of world, since by then

count only ten babies born since end of Z. War which rendered universal male sterility for all but few men trapped in ruins or bunkers. It's too soon to tell if some babies sterile or not. Officials further state population of world now less than a million, and civilization being maintained only because of automation in foods and consumer goods. Countess Lurane says "I will trace my circuits for back-mover on sands of this beach. Will try sometime this week for back-when."

World hopes and love go with her into savage past. Goodspeed, Lurane.

The news photo of Lurane and her house is in full color, and despite the thinness of the paper, it reproduces in a fantastic stereopsis. 3-D.

The story is dated: New LA, April 4, 2072.

I AM ALMOST the end of Springtime, but all the day I watch my hands, every day with only the crying, wheeling gulls for company. But I'm not lonely. At the bottom of the cut-out news item, Lurane had written: "I love you, Ben Thornton. I'll be back somehow."

I watch and I will go on watching for my heart is forever involved with her. Perhaps it is too soon for my vigil but I don't know. I just don't know. Printed circuits, drawn circuits.

I wait for my son to be born, so that there may be Lurane in my unborn again. ©



"Yes, it is a small world," isn't it?"



Playmate #2 (left) and Odalisque (below) are from the collection of John Howard, while Entourage (bottom) is owned by Alan White.

THE ART OF GEORGE BARR



There are a few artists who have specialized in the art of the fantastic and in science-fiction. Some of these are considered "old masters" and hang in museums: Dalí, Beardsley, Bosch, Chagall, de Chirico, Deré, Klee, and Kley. Some of these are relatively unknown and their work appears only in books or magazines: Tim Kirk, Hubert Rogers, Freas, Gaughan, Carter, Hannes Bok, Alona Austin, Norman Lindsay, and George Barr.

I can hear George's protesting yell right now for including him in with The Biggies, but the truth is that George has a unique talent and a lot of it. His style is composed of careful, even painstaking craftsmanship, some excellent ideas, a sense of humor, and a dash of madness.

His illustrations have appeared in many of the science-fiction magazines, and on the covers of numerous science-fiction paperbacks. He was born in Arizona in January of 1937, raised in Salt Lake City, moved to Los Angeles in 1968, and to San Jose, California in 1972, where he lives in a house full of both art and the air of art production. George has done most of the things that commercial artists have done: posters, letterheads, business cards, travel brochures, newspaper ads, portraits, scenes, murals, mosaics, costume design, and even some specialty makeup for *Star Trek*.

"I think of art—and especially illustration—as communication," George says. "I have little feeling or sympathy for the kind of art which only the 'artist' and a select few elite can comprehend. What I enjoy most is pleasing people. I feel that illustrations should complement the text—not necessarily clarify it, but just make the reading a bit more enjoyable."

"I enjoy other people's art very much whatever their style or treatment. I'd hate to have people think that because I work a particular way, that I feel it is necessarily the best way to work. It is just the way I feel the most comfortable working. I greatly enjoy the work of Richard Powers, the abstract-



tions of the Dillons, the design of Jack Gaughan, the concepts of Kelly Freas, the humor of Tim Kirk, the sensitivity of Alicia Austin. These—not my own work—are what I choose to hang in my home.

"I like artists as people. I enjoy hearing how they work, and why it's not a matter of speaking the same language—far from it. Artists have no special language, despite of what non-artists may think. All we usually have in common is that we use the same method—that of creating a visual image—in an attempt to communicate something of ourselves to someone else.

"That's all I'm trying to do—besides making a living—to communicate to the viewer a bit of the same pleasure I had in creating whatever he's looking at."

George is one of the three major "fans"

artists, along with Tim Kirk and Alicia Austin, in that special sub-culture of science-fiction fandom that holds regional and world conventions every year. The Hugo awards (fandom's Oscars) were first presented in 1953, but an award for Best Fan Artist was not created until 1967, and George Barr has been nominated every single year since, and won the second such award given in 1965.

George, Alicia, and Tim (who was profiled in VERTEX 2) have tried a number of interesting cooperative ventures, an experiment I have not seen elsewhere except perhaps in the pages of the comic books. One of them will design and pencil in a drawing or painting and one of the others will finish it. It results in an unusual combination of ideas and styles. They each know each other well enough, personally and professionally, to be able to blend the ultra-personal expressions very well.

George says he has worked freelance for about fifteen years "making barely enough to justify not getting a steady job" but it is obvious that George is doing what he likes to do, and well.

Another long term project is one that I am personally eager to see. Working with Don Simpson and others, George is helping to create the study of a man of the future, a galaxy traveler, complete with mementos, mementos, trophies, photographs, and research material from all over the galaxy. This will be a full-sized room that you can walk through, and will appear, some time in the future, at a world science-fiction convention. Among other things for it, George has done some very beautiful alien furniture from six legged beasts.

I have found George Barr to be very articulate with words, as well as with paint and pens, and this is a rarity among artists. Usually artists say what they want, to say with art and those who are not artists do all the talking. He is technically inventive and some of his color work has been done with ball-point pens! Yet when you look at the painting the last tool you would think of is a ball-point!

The greatest thing an artist needs is the freedom to create. Sometimes that freedom is money, simply to live on, and buy material. Sometimes that freedom is from political or religious pressures. But in the case of Mr. Barr it is just time. The freedom of having enough time to do all the rich and lush ideas that flow so generously from his headbone. O

The two paintings shown above are science fiction convention name tags, the one on top done for Linda Shad, while the painting at right, titled "Lullaby," is from the collection of Alex Eisenstein.



knew that they have nothing to fear from the fathers who know more than they. But the children don't know, and so the things Munders really want most, the things that others already have, we cannot have.

The children don't know. All they can sense is that there are those who are different. I suppose they really would not object too much if the difference was not something like minding. Something that strips away their coverings and opens them totally to complete strangers, to people who could ask for anything and get it . . . or, worse, to close relations who are different even so they are not instant inadequacy for the self-needed man, and instant honesty for the closed and manipulative leaders of the world.

Yes, I can understand their position. The choice to either remake their world overnight into something based upon qualities they have dismissed as impossible, idealistic things . . . or to eliminate those who would force the change. To change the Munders into harmless things, to chase them down, to catch them and kill them. To eliminate the freaks who would make the ways of the normal ones obsolete. To kill the hope that in years to come a new world might spring, a world based upon mutual knowing that would lead to identification, respect, friendship and love. I can understand why they would rather kill their tickets to their new world. Why they would kill their hope, their progress. Why they would stalk those who would force them to love their neighbors, love their world.

Oh, God, it is sick. So sick and lonely. After awhile it does no more good to say that you are right, even though you cannot help but understand what they think about you. To look at someone you don't even know . . . maybe at some girl who you might someday fall for . . . so look and know you're hated, know they wish you dead if you can see into them.

I am like an X-Ray machine. Sometimes I wish that X-Ray machines were alive. I would speak to them of love and of hate, and they, too, might understand why a vain race might someday destroy them simply because they could not stand the thought of being exposed, totally exposed, to a machine. A machine . . . let alone a man!

I tingle . . . someone is minding me. ME . . . someone minds a Munder? No, the window is probably open further down the Overway car, and I confuse a brecc for companionship and I confuse Only a breeze.

Yes, there are other Munders. And there are the false ones, sent out to pro-



In the world of the blind, the one-eyed man is king. In the world of the telepathically deaf, the telepath is a menace to be killed on sight.

feel false thoughts of minding to trick us. They send out their poison thoughts of help and then they see our desperate faces, and they pounce on us and kill us in the name of what is decent in the world. "As end to the treasonous ploys into the state of things," they say.

If it wasn't a breeze it was something terrible. A false minder, hating me on, getting me to think, to look, to mind again. Then they would see me minding. They would force me to put myself into the open and look for a friend who is near. Then that false friend would kill me with his beamer. He would shake upon me the heat of death and I would be no more. An empty seat where I was, and a threat to them that would be a threat to more.

They used to do other things, the Beamers. They would hunt all types of wrongdoers, and see to it they were confined where they could do no further harm. But then the wrongdoers discovered the Minders were there. They could not hide from us, no more than we could neglect and forget their evil thoughts once we minded them. We did the only thing that a people having no need of terrible conspiracies and secrets could do.

We reported the wrongdoers to the Beamers, and the wrongdoers were confined. Sometimes they were beamed immediately, as their thoughts merited, for if the evidence against an individual comes from within his own mind, then he is surely guilty and should be punished. The fact that he is caught before he has done the deed makes the deed none the less terrible. So they were killed.

I still do not agree that the thought, the planning, is as terrible a thing as the doing. But perhaps that is because I am a Minder, and do not really understand such things as the Non-minders do.

There came a time when the wrongdoers were all caught and confined, and those who were free and wished to retain their freedom abandoned their evil thoughts, tried to hide them with thoughtlessness composed of constructive ideas and philosophies. They ceased to be wrongdoers. They became good people, and some joined the ranks of the Beamers and the groups of men with whom the Beamers must work. It was probably then that the sickness of our paradox came about, for when the Beamers have no more wrongdoers there is nothing further for them to do.

The devils, the distorters of ethics, finding their work gone, made new work for themselves. We, the Minders, were declared the wrongdoers. We were sought after we were hunted, we were confined. But imprisonment cannot stop

the gift of a Minder. He minds just as a sighted man sees. That became the logic of the Beamers. To blind a man put out his eyes, to eliminate a Minder, put out his mind!

When the leaders discovered they could hide nothing from us, state secrets and all their other meaningless institutions vanished by defilement. How could there be secrets, intrigue, conspiracies and propaganda, when such things ceased to exist after the mind took over from the tongue and the eyes? They, like the former wrongdoers, felt their engines skipping away from them. And so the leaders, the Beamers and the old wrongdoers each discovered they had something against us. In desperation, as an urge to be comforted by a sharing of their mindless worries, the leaders began to identify with the Beamers. I remember when the thoughts first started to come. I remember how the Minders all said things like No, it cannot happen, it would not happen, it would make no sense. But it came to be. We were wrongdoers. We were freaks, and we became freaks to be hunted, to be caught, to be killed.

It is evil to harbor evil thought against those in power. But is it evil if they seek to kill your friends all you know

including yourself? Is it evil to hate the forces that would seek to kill me when I have done no wrong? There must be some reason for the power of the Minders being in existence. If there was no reason, it would not be here. Therefore, as they do not have the power and we do, it is we who are right! I have been mistaking the possession of power, of leadership, for the property of being right, of having your existence justified . . . that which seeks to live and to be open must take precedence! No . . . I know I am right!

I know the Minders are the ones who should win. That is why I am fighting to win, in every way I can. That is why we must win . . . there it is again.

No I was not imagining it. Another single. It can only mean that another Minder is in the car with me was minding me.

Alright. I know Who it is? Nothing. Why don't you mind something to me? I want to know WHO YOU ARE? I keep hearing about the other Minders, but when we were declared wrongdoers, and the decision was made that contact would lead to capture, we all went our separate ways. It was when I was so young I have trouble remembering. But

what I do remember is that we all were told to go out of our way to make sure that families with Minders moved

and changed their names, and that no Minders remained in touch with each other. But that's just like running, and never stopping. It's all wrong . . . it's got to end now because . . . because now I realize that we have to fight. And for that we have to come together again. Got to know who we all are. Listen to me.

I am minding like I'm only imagining. I'm minding with someone!

I really can't blame you for not coming out and minding me in the open. But don't you understand that you're becoming like the Non-minders by believing this way? You're hiding. Minders don't have to hide. There are no secrets. There is nothing to hide!

Alright . . . so I could be a false minder. But I'm not. I wish I could prove to you that I'm not, but I can't . . . unless you let me! Mind me. Don't leave me with a lonely riddle that won't do either of us one bit of good. If you do, the chances are that after we both leave this Overcar neither of us will ever be able to find the other again. We would still be at all the other Minders . . . alone with our selves, and the minding thoughts of almost all the world. PLEASE!

I know what you are feeling, even though you're not minding it to me. I would think the same thing if our positions were reversed. I'd be suspicious I would think I was being contacted by a false minder.

Okay . . . so I could be a false minder. But if I was . . . I wouldn't be able to mind you . . . to read your feelings or feel your ringing as our minds are and porred. No . . . that's not right. I could still be a false minder, just pretending to sense you . . . sitting in the dark, waiting for you to bring yourself to minding so that I could get a look at you. The only way you can be sure of that it is true me but you probably feel you do not have to take that risk. That if we both go our separate ways you'll escape, that your escape will make up for the fact that you will never know whether I am a true Minder or a false one. But it would not make up for it. From your position I know you are not a child . . . but I have seen them beam a child, once . . . a little boy who kicked his legs at the mental image of some woman compared up by a Beamer. If we keep on escaping these would be more of that. Or would you rather help to end that sort of thing?

Don't you see? If we do go our separate ways you will gain nothing. I will gain nothing. I know you are a true Minder. Won't you give me a chance to prove to you that I am also one? That we are both the same?

Okay . . . do not move. If you are looking out the window don't move. If

you're looking straight at me don't move I won't move either. We're Munders and we can exchange thoughts without touching each other's faces. So you don't have to take a risk. But PLEASE read me and let me know it. Ah, the tangle!

Hello!
I'm reading you fine. Keep reading me, and don't move. There may be a false murder nearby.

What is fifty-five plus fifteen?

Seventy.

So you are a true Munder... I... I'm sorry for being so careful, but I, too, feel that the time has come for us to bond together! When I minded the same thought I thought it was too good to be true.

That's certainly a relief. For awhile I thought, even after I knew you were a true Munder, that you would not agree with my ideas, and therefore fail to mind me further.

As you said... that would have accomplished nothing.

Well, I'm glad you agree. I just came to my decision on the subject quite recently... in fact, in fact, you were probably minding me at the time.

Yes, I was. That is what made me sure that I would mind you further, and allow you to mind me.

I would have been able to trace your thoughts, but with the number of people in the car at this hour and with so many stops along the route, I could easily have missed you.

Yes, I knew that, too. That is just what would have happened had you not answered any mathematical question correctly the first minding.

You know, that's a good idea. It would be totally unexpected to a false munder, and depicts a genius answer. It's either w-e-n-t-y or nothing, and no second chances! But now that we each know the other to be a true Munder, what do we do next? The logical thing to do would be to meet each other, so that we would each know the other when we next met.

But how could we do that without being conspicuous?

Do you live near here?

No.

Good. Neither do I. Which is why I think it would be a good idea if we were both to leave the Overway at the next stop.

Suppose we are the only ones to leave? We would still be noticed.

You're right... well, then, if at least oh... three more people get off at the next station, we shall leave along with them. Does that seem safe enough?

Yes, it does! But if there are going to be at least five people at the stop, how do I tell which one is you?

A good question... suppose I drop

my identity card, which we all must show at the station?

That will be agreeable... especially since I would then be the one to see you first.

That is why I suggested this means. I sense you are still somewhat uneasy. I would be uneasy too in your place.

Thank you for understanding. It is terrible sometimes, to be seeking companionship and to be afraid of it at the same time.

Please don't describe it. I know that feeling all too well.

Feel... we are slowing down. The station is almost here.

Soon we will know each other's appearance.

Watch as the people leave the Overway. Yes, there will be more than three. Come.

I am taking my identity card out. In your excitement, do not forget to read mine!

And please do not forget to drop yours.

I have not minded a joke in many years. It is a good minding!

The doors are opening... I will not look at anyone else, for I do not know who you are.

I am dropping my card.

I am looking around, as if lost. I... see you. You are just picking your card off the floor. You are...



It it was not a trick,
if the other person
was true, perhaps, at
long last, his
loneliness would end.

What? You're a woman? You've... stop wandering there so still, we will attract attention. Keep calm and move naturally. Do not think of other things until we have been paired.

A man...

How I must strain to smile at the non-minding devil. But under his smile he can be trying to mind me something that I will react to. Must not mind him, must not... Good. It is over. I am paired.

... And I am paired, too.

Now we may mind freely in each other. I find it hard to mind consciously.

Let us sit and mind each other completely. A total minding, with the other knowing what is in each's thoughts. It is easy and flowing. We are much older from our knowledge and beliefs. We are flowing, each into the other. We are becoming one thought stream, one memory, one fantasy, one hope, one...

Now I understand why you have come to the conclusion that we must fight the non-minders as they are fighting us. I understand completely.

And I now understand the feelings which have kept you from reaching this conclusion for most of your life. But now we are of one thoughtstream, and we are both free!

How sorry I feel for the Non-minders. How do they come together without the complete minding? We are the first who have dared, and I wish all Munders could know the ecstasy we feel now...

I know. Loneliness is gone, the fencers hovering over us must have been moved. We shall live in a large field now, in the open, instead of a small cell of brick.

Yes... we must work, then we must look. We must search out as many Munders as possible and bring them together, and we will all be one thought-stream.

No more fears such as I have had. No more jealousies like the ones I have minded from the Non-minders. I shake at the recollection of such bitterness. Soon, we shall all be one. We will not lose our individualities, but we will share them and enjoy our lives all the more.

But we should not be minding all this here. Let us leave the Overway vicinity.

Look. It is Mine! So fitting!

What? Your thought is obscured with mindings of irony. I cannot mind you!

Do not worry. Look at the Overway station. It is ironic, and it is fitting. The sign! I have been taking this Overway for my entire life, and until now I have never noticed the name of this place!

Yes...

The sign... the station we chose to depart from our lives of tragic fear and come together. Haas... the sign of Union Street!

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